RAILROAD GAZETTE

FRIDAY, JULY 31.

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Contributions.

Vermont and New Hampshire Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice a communication in your issue of July 17, signed P. B. C. The extension of the Maine Central from Fabyans to Lancaster and the acquisition by that company of the Upper Coos road, thus forming a line to Quebec via the Quebec Central and Dudswell Junction, may prove an injury to the Concord & Montreal; but if a map of the territory is examined, it will be found that it is a far greater injury to the Boston & Maine. The Quebec Central connects with the Boston & Maine at Sherbrooke, and its business formerly went to the Boston & Maine at that point. The Boston & Maine and Maine Central being in the same interest they simply compete with themselves.

The new project of building a Boston line via Rouse's Point, mentioned by your correspondent, may be for the purpose of "pocketing" the Concord, but a look at the map will again show that it will be another case of the Boston & Maine expending large sums of money to compete with itself. This line would render about 100 miles of Boston & Maine and 60 miles of Canadian Pacific practically valueless. If the present policy is continued the stockholders of the Boston & Maine may find that they will have neither the Concord & Montreal nor their dividends in a "pocket." H. F. R.

A Case Where Safety was Luck.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There is a road running out of Chicago which among other things advertises speed, comfort and *safety*. The road is double-track for a long distance, and runs solid vestibuled trains. I will relate an incident which happened to their fast, limited, vestibuled, westbound train, at about eight o'clock one night last winter.

The train consisted of eight cars out of Chicago in the following order: Two baggage cars, a tourists' sleeper, two chair cars, two Pullman sleepers and a dining-car. Steam from the engine is used in heating. When about 20 miles out of Chicago it was discovered that the heating arrangements of the tourists' car were out of order, and steam could not be given to the cars in the rear. So the conductor decided to place the car at the rear of the train at the station when the dining-car is set off, which is some 80 miles or more from Chicago. So far all right, unless it was that a large number of passengers had to do without the comfort of warm cars.

Where the diner is dropped is a small station where there is probably 1,000 feet of straight track with a curve of probably 5° or 6°, both east and west of the station. The first movement was to back the diner in on a siding, backing in the direction from which the train came. Then, to place the tourist car at the rear of the train, *both east*, and *westbound* tracks were used in the following manner: The baggage cars and tourist sleeper were disconnected from the train, which was left standing on the westbound track. The engine, with these three cars, pulled down below a cross-over, and backed the tourist car in on the eastbound track. Then the engine returned with the two baggage cars, pulled the balance of the train below the cross-over and backed through it again to get the tourist car in the rear of the train, where they desired it.

The whole performance seemed to be a planned death trap. In the first place the train was not protected on *either end* or on *either track* by a flagman. (The writer of this took upon himself to take the red light, which by the way had no torpedoes attached, and protect the rear of the standing train.) In the second place the train was short-handed, there being but three men, a conductor—flagman and train porter (colored)—to do the work. In the third place the eastbound track should not have been used at all, but the entire change should have been made with the aid of the empty siding on which the dining-car was set. The change as they made it occupied 24 minutes.

There are a hundred lessons in this incident, and it is probable that there are a hundred such incidents happening every day throughout the United States.

RED LIGHT.

The Reno Tunnel System for Rapid Transit.

NEW YORK, July 14, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of June 13, "Slow and Sure" offers two objections to Mr. Reno's rapid-transit plan. These objections refer to the efficiency of the internal bracing of the tunnel, and to the inability of the tunnel to exist, as such, unless supported upon "foundations." In the opinion of "Slow and Sure" these objections are inherent, ineradicable and due solely to the rectangular shape of the tunnel, and would not exist if the tunnel were a tube, circular in cross-section.

Confusing the two questions of internal bracing and external foundations, "Slow and Sure" having first found that a circular tunnel may be designed devoid of internal bracing and yet non-collapsible by reason of the external pressure to which it is to be subjected, he then formulates his theory that in all previous works of this nature a tunnel having "a circular section has been adopted at a great sacrifice of available space, simply to avoid the necessity for foundations by providing a continuous and self-sustaining arch." And he continues: "With a circular section it makes no difference what changes take place in the bed of the tunnel, since the tube is free to adapt itself to such alterations without incurring any weakness for want of proper bracing." Practical engineers accustomed to tunnel and mining work will tell "Slow and Sure" that any unequal settling of the bed of a circular tunnel would be disastrous, notwithstanding its circular section; and that the practical success of any tunnel work depends upon the natural stability or supporting effort of the ground driven through. Carefully conducted borings along Broadway show an absence of treacherous ground.

Practical engineers will likewise testify that the great strength of the tunnel of circular section becomes evident only when the external pressure is the same in all directions. Such a tube will collapse if sufficient external pressure is applied at any one point. In the Reno plan, not only can the tunnel itself, but also the header-shield be, amply braced against all pressures with the same facility as the header-shield of circular section, and it is only a question of competent engineering practice to brace the rectangular tunnel and have such a factor of safety as to insure against accidental rupture. "Slow and Sure" concedes that a rectangular shield would offer a greater resistance to a revolving or turning movement than would a circular shield. And this resistance will in fact be almost infinite compared with any tendency it might manifest to turn as if upon an axis, even if the rectangular shield should be subjected to the same phenomenal causes as the circular shield; but, from its shape, construction and the mode of operating it, this seems highly improbable, if not impossible, with the flat shield.

One other objection (as to ventilation) has been raised by an "Occasional Correspondent" of the *Railroad Gazette* from London under date of June 28. It is evident, however, that there are two points which this correspondent has overlooked: First, that the 54-in. electric fans proposed by Mr. Reno have each a guaranteed efficiency of 32,000 cu. ft. of air per minute, and they will be placed only one-quarter of a mile apart along the line. Second, that in the Reno tunnel the various tracks are only separated by a row of vertical and transverse beams, giving abundant space for the air to part in front of a rapidly moving train, thus causing no "opposing draught" to the ventilating fans. The numerous obstructions to the volumes of air to be moved, in the case of the mines having such immense fans as those mentioned in the London correspondent's letter, will not exist in any tunnel constructed under New York upon Mr. Reno's plans.

SURE AND PROGRESSIVE.

American and English Freight Cars.

18 BISHOPSGATE ST., LONDON, E. C., June 24, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest the letters of "Englishman" and Mr. W. A. Adams upon this subject, published in the columns of your valued journal of June 12, page 401, and as my name appears in both of their communications, I beg the privilege of replying and calling attention to some anomalies.

"Englishman" says: "A few weeks since, from a station on the badly managed South Eastern Line, I wanted delivered in London about a ton and a half of materials. We saw it loaded on the truck (wagon) on the Saturday, and it was not until Wednesday morning that Sir Edward Watkin's wretched management allowed us to have these things in London, a run of 20 miles only. . . Now, how should we have been fixed had we had to wait for a whole 30-ton wagon to be filled up?"

Your correspondent does not say whether his shipment was of feathers or pig iron. But never mind that. Sir Edward Watkin's management differs not from other English lines. These are six of one and half a dozen of the other. Who in America handling railway traffic would think for a moment of waiting to get a 30-ton load? Small shipments such as your correspondent "Englishman" refers to would be handled in America the same as milk cans are handled in England, where the milk never sours for want of quick delivery.

I have just received a shipment from Messrs. Jones & Colver, of Sheffield, of the following materials:

	Cwt.	Qr.	Lbs
Cast steel	5	3	7
Chisel steel	—	3	24
Double shear steel	3	0	2
Blister	2	2	14
Total	12	1	19

This material was delivered in one wagon weighing about five tons, having been hauled 120 miles by rail, and the wagon returned empty. I hope that it is not necessary for me to explain how such a handful of freight would have been handled in America, either for the edification of "Englishman" or any of your numerous readers.

The moment the flange of one of the leading wheels impinged upon the rail, that moment the rail would become an obstacle that my strength could not overcome, and this seems to be where your correspondent, Mr. W. A. Adams, is misled. The four-wheeled wagon is always seeking a tangent of its own, and if there is between the parallel of rails and wheels a difference of only one-fourth of an inch between the flanges of the front as compared with trailing wheels, it is sufficient to create friction to an extent that cannot be imagined through any theoretical reasoning, while the bogie truck begins the moment it starts to adjust itself to the alignment of the rails irrespective of the tangent of the body of the wagon.

"Eglishman" says: "At the same time, had I to push long car interests with English managers, I should try some other plan than telling them that they are a set of blind idiots and must be fools if they cannot see that it is to their interest to buy very long cars," intimating that I had made some such remark. I do not consider that comments upon this statement are necessary from me, but it would be interesting to know who "wound him up," for certainly he has never heard from my lips or pen anything of the kind.

Another thing, if "Englishman" was familar with his subject, he would know that "English railway managers" know little or nothing of the mechanical part of working their railways, and would never think of giving an opinion upon rolling stock without consulting the locomotive or carriage and wagon superintendent whose opinion they have sought and obtained for me on the subject of bogie trucks, which opinion has always been adverse. Had they ever used bogie trucks? No. What is a man's opinion worth on a thing he knows nothing of?

Your correspondent, Mr. W. A. Adams, has not evidently taken any notice of the suggestion made to him at the last October meeting in London of the Institution of Mechanical Engineers, by Col. Geo. Earl Church, C. E., Am. S. C. E., who advised him to have the axles of his brougham fixed rigidly, parallel to each other, and then ride round a corner in it, if he wished to get the effect produced upon the vehicle and load of an English four-wheeled freight wagon. I would give half a dollar to see him try it; no other explanation would ever be necessary. M. R. JEFFERDS.

Pneumatic Interlocking at the Jersey City Terminus of the Pennsylvania Railroad.

BY H. M. SPERRY, *Supervisor of Signals, New York Division.*

The pneumatic interlocking now in course of construction by the Union Switch & Signal Company at the main terminal of the Pennsylvania Railroad at Jersey City will consist of three towers:

Washington Street (A) tower controls the yard tracks leading to the new train shed. Newark avenue (N A) tower is located at the beginning of the elevated structure for the four main tracks, and controls the junction of these with the six yard tracks. New Jersey Junction (R U) tower is at the west end of the elevated iron structure, and controls the junction with the New Jersey Junction Railroad, and with the Waldo avenue passenger storage yard.

Beginning at the east end, the tracks in the train shed are 12 in number, with a clear standing room for cars as follows:

No. 1	829 ft.	No. 8	72" ft.
" 2	739 "	" 9	727 "
" 3	739 "	" 10	600 "
" 4	739 "	" 11	600 "
" 5	817 "	" 12	600 "
" 6	727 "		
" 7	727 "	Total	8,571 ft.

This standing room is measured to the clearance point of each track, the train shed being 652 ft. 6 in. long and 256 ft. wide. These tracks are connected with five yard tracks, the switches being so arranged that movements can be made from any of the five yard tracks to any of the twelve shed tracks, thus making it possible to use any of the tracks in the shed either for inbound or outbound trains. This feature is of great importance on

holidays or at other times when it is necessary to handle an unusually large traffic. This was accomplished by introducing an X crossing consisting of No. 8, movable point, frogs and slip switches. No. 8 slips were used in order to avoid curves of a short radius. Those through the slips are the sharpest in the yards, 484 ft., all other curves having a radius of not less than 600 ft. This avoids the usual difficulty in handling long sleeping cars on sharp curves.

The yard proper ends at Henderson street, the six tracks here forming a junction with the four main tracks. The east bound or inbound passenger track here crosses over to the south of the six yard tracks. The four tracks from this point west are used as follows:

No. 1, for westbound empty cars to Waldo avenue yard.

No. 2, for eastbound empty cars from Waldo avenue yard.

No. 3, eastbound main.

No. 4, westbound main.

Nos. 1 and 2 are used in the left-hand direction; this avoids crossing empty trains in front of the train shed, as the westbound empty trains originate from the eastbound loaded trains, and the eastbound empty trains make up the westbound loaded trains. It also facilitates handling them at Waldo avenue yard. At New Jersey Junction the empty tracks Nos. 1 and 2 connect with the Waldo avenue passenger yard. A complete system of cross-overs at this point provides for movements in all directions.

The machines are of the usual pneumatic type (described in the *Railroad Gazette* of Dec. 21, 1888), except in one particular—the substitution of the electric switch valve in place of the pneumatic switch valve heretofore used. The machine at A tower requires a floor space of 4 ft. 6½ in. x 16 ft. 7½ in. Washington street (A) tower is a handsome brick building 14 ft. 10 in. x 25 ft. 4 in., two stories high, with a basement. It is built of pressed brick and the roof is covered with Spanish tiles. The two bay windows are of glass and galvanized iron. The machine is located on the second floor, and the table for the train director and operator is placed in the bay window. Access to this floor is by means of an outside staircase. The first floor is divided into two rooms—one for the yard master and the other for the foreman in charge of the interlocking. The latter has a small turning lathe. The tower is heated throughout by steam and lighted by electricity.

At Newark avenue the tower is entirely of iron, as the space at this point was limited. The first story is but 7 ft. wide, the second story spreading out to 11 ft. 6 in., and ample floor space is obtained by making the build ing 22 ft. long. The framing is of angle iron, and is anchored to the foundation by six 1¼-in. iron bolts. The house is sheathed and roofed with No. 22 corrugated iron.

New Jersey Junction tower is the usual standard tower, wooden frame, 14 ft. 10 in. wide by 15 ft. long. It is sheathed with corrugated iron, and has a slate roof.

Switch Valves.—The electric switch valves are fixed to the switch cylinders at the switches, and operate the D valve controlling the admission of air to the switch cylinders. By reference to the diagram showing the operation of this valve, it will be seen that in the first or normal position of the switch lever the normal magnets of the switch valves are charged, and their armatures attracted, opening the small pin valves and admitting air behind the small pistons which actuate the D valve. The D valve is also locked in this position by the small plunger operated by the locking magnet (the centre one of the three). To reverse the switch, the lever is moved to the right, and in the second or half normal position the spring at *A B* makes contact, completing the circuit, charging the locking magnet which unseats the pin valve and exhausts the air on the upper side of the locking plunger. The pressure on the opposite side then withdraws the locking plunger, thus unlocking the D valve. In the third or half reversed position the circuit to the normal magnet is broken and that to the reversing magnet completed. The air entering at the opposite end of the switch cylinder operates the switch and lock movement, throwing the switch and detector bar. In the fourth or reverse position the circuit to the locking magnet is broken and the D valve is locked in its reverse position by the plunger, thus completing the operation.

By reference to the section through the electric switch valve it will be seen that the air pressure enters at the rear of the D valve and is conveyed to the small pistons that operate it through their piston rods, being controlled by the valves operated by the armatures of the normal and reversing magnets. There are 75 of these electric switch valves at Jersey City.

In addition to the electric switch valve, an indication box for each switch is arranged so as to make or break the circuit operating the indication latches on the switch levers of the machine. This feature corresponds in a measure to the facing point lock of the mechanical machine, and requires the switch to properly complete its action before the switch lever can be thrown home. A single switch requires four wires, three for the electric switch valve and one for the indication. A crossover requires five, one additional wire for the additional indication box. The accompanying diagram shows a crossover with two electric valves complete, but, it will be observed, the electrical connections are the same as for a single switch. All wires from the machine to the switches and signals are run underground in wooden boxing.

The electric current is supplied from a storage battery placed at the tower, consisting of a system of six cells, giving, normally, twelve volts E. M. F., with an extra six cells for a change every 24 hours. These batteries are charged by a current from the Jersey City electric light station.

The compressed air at 65 lbs. pressure is supplied by two 10x12-in. Norwalk compressors located in the dynamo-house at Waldo avenue yard. From this point it is conveyed in a 2-in. galvanized iron pipe to the Jersey City station, where a reserve compressor is located. From the 2-in. air main connections are made to the switches and signals by ¾-in. pipe connections, and there is a small auxiliary cast-iron reservoir at each switch and signal. Gate valves are placed at convenient points in the air main, in order to shut air off from a section of the pipe when necessary to make repairs or changes. The reserve compressor is kept ready for use at all times and is operated for half an hour every Monday, Wednesday and Friday. Communication between the two compressor plants is by bell signal.

Operation.—Communication between the three towers and the train shed is by means of train describers,* annunciators and telephones. A tower is notified of the arrival of the ferry boats by means of an annunciator with two drops, one for Cortlandt street and the other for Desbrosses street boats. The conductor receives notice by means of the boat slips, he in turn notifying the gatemen in the waiting-room by gong, and as soon as his train is ready to start he notifies the train starter at the east end of the station by one of the platform push buttons, there being two push buttons on each platform from tracks 5 to 12. The train starter then notifies A tower by the train describer, A tower in turn notifying, N A and N A notifying R U and S C (Shanley's Cut).

Notification of eastbound trains is sent from S C by bell to A tower; S C at the same time notifies R U by train describer, R U in turn notifying N A, and N A in turn notifying A. A tower notifies the train dispatcher by describers and the ferries by bell. In addition to this A tower is provided with 12 rotary indicators, operated by the insulated track sections in the train shed, showing which track is blocked or clear. Notification of empty trains to be moved from train shed to yard is by an annunciator with 12 drops. The object in using the annunciator for this purpose is that the number can be left visible until the empty train has been moved. The train starter also notifies the dispatcher's office of the departure of all trains.

The force to operate the three towers will be:

A tower, three train directors, three levermen and three operators.

N A tower, three levermen and two operators.

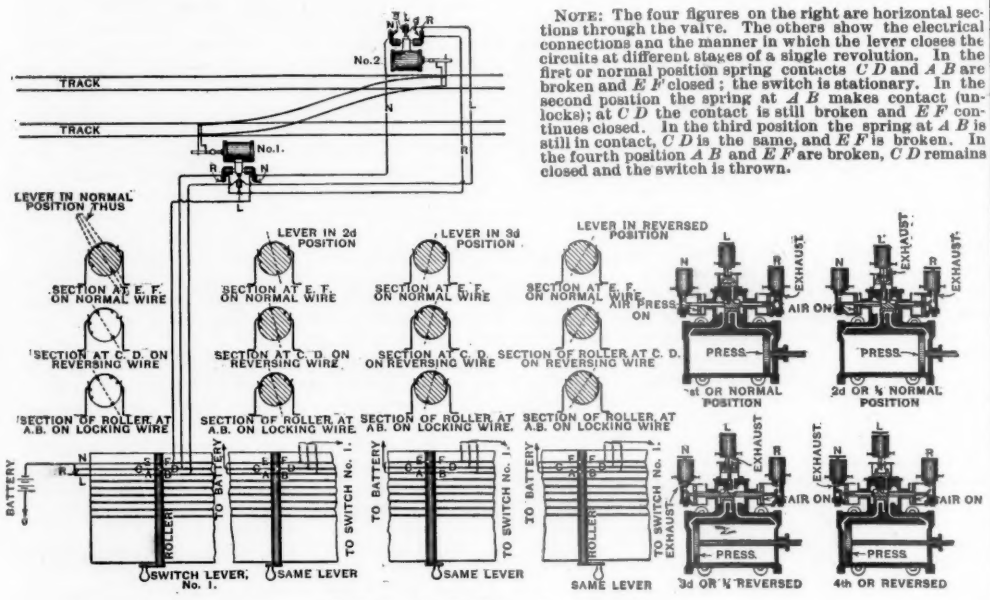
R U tower, three levermen and two operators.

With the exception of the operators at N A and R U, they will work eight-hour shifts.

The enginemen now in charge of the dynamos at the Waldo avenue and Jersey City stations run the compressors, making it unnecessary to employ special men for this work. There are five signal repairmen, divided into a day and a night force, and four lamp men.

Owing to the impossibility of completing the elevated tracks until the surface tracks and temporary shed were abandoned, it was only possible to put a portion of the interlocking in service at A tower, and at N A and R U very little of the interlocking work has been done, though the towers are up. It is expected that before the close of this year the entire system will be completed. As high as 130 train movements have been made at A tower in one hour, and trains are handled with little or no delay. The schedule shows 244 trains daily. This does not include sections or specials.

A novel feature at A tower is a small air whistle, fixed outside the bay window and under the control of the train director, to be used as an alarm or danger signal.



NOTE: The four figures on the right are horizontal sections through the valve. The others show the electrical connections and the manner in which the lever closes the circuits at different stages of a single revolution. In the first or normal position spring contacts *C D* and *A B* are broken and *E F* closed; the switch is stationary. In the second position the spring at *A B* makes contact (unlocks); at *C D* the contact is still broken and *E F* continues closed. In the third position the spring at *A B* is still in contact, *C D* is the same, and *E F* is broken. In the fourth position *A B* and *E F* are broken, *C D* remains closed and the switch is thrown.

N, Normal. R, Reversed. L, Locking.

ELECTRIC SWITCH VALVE FOR WESTINGHOUSE ELECTRO-PNEUMATIC INTERLOCKING.

All the tracks and switches have been laid with 85-lb. rails.

Signals.—The signals are of the usual semaphore pattern, high signals for running (full speed) movements and dwarf signals for drilling or reverse movements. With a view to preventing mistakes by enginemen as to which track a signal is intended to govern, special care was taken to locate every signal to the right of the direction of movement and next to the track it governs, or else directly over the track. This made it necessary to erect eight signal bridges. The five distant signal arms on signal bridge No. 4 constitute a new departure in signaling. By connecting them with a track circuit on their respective tracks in the train shed, they are thrown automatically to the caution position by the presence of a train on the train-shed track. If, for instance, a train is to enter track No. 1, the track being clear, the home and distant signals would be cleared; as soon as the train enters the shed it would automatically throw the distant arm to caution, and the following train for this track would then receive a clear home signal with the distant arm at caution, indicating a train in the shed. This gives the engineman information in ample time to control his train, whenever it is necessary to run two trains in on the same track. This is looked upon as a great improvement over the old method of giving a hand signal when "doubling" trains in, and should be far more reliable.

The dwarf signals have rubber arms, as illustrated (style B) in the *Railroad Gazette* of Dec. 19, 1890, page 869. No trouble has been experienced from placing them between tracks.

Between Newark avenue and Shanley's Cut, a distance of 1.3 miles, the east- and west-bound main tracks have been divided into six automatic block sections.

Between A tower and Shanley's Cut tower there will be 106 signals.

INTERLOCKING.

Towers.	A.	N. A.	R. U.	Total.
Switches	29	12	14	55
Single slip switches	..	1	..	1
Double slip switches	7	2	..	9
Movable frogs	7	3	..	10
Signals	53	16	15	84
Working levers	63	21	19	103
Spare levers	8	14	4	26

Train Accidents in the United States in June.

COLLISIONS.

REAR.

2d, on Toledo, Ann Arbor & North Michigan, near Howell, Mich., a freight train ran into the rear of a preceding freight, wrecking engine and several cars and injuring a brakeman.

2d, on Cleveland, Akron & Columbus, near Orrville, O., a passenger train collided with a freight car standing on the main track, doing considerable damage. Engineer injured by jumping.

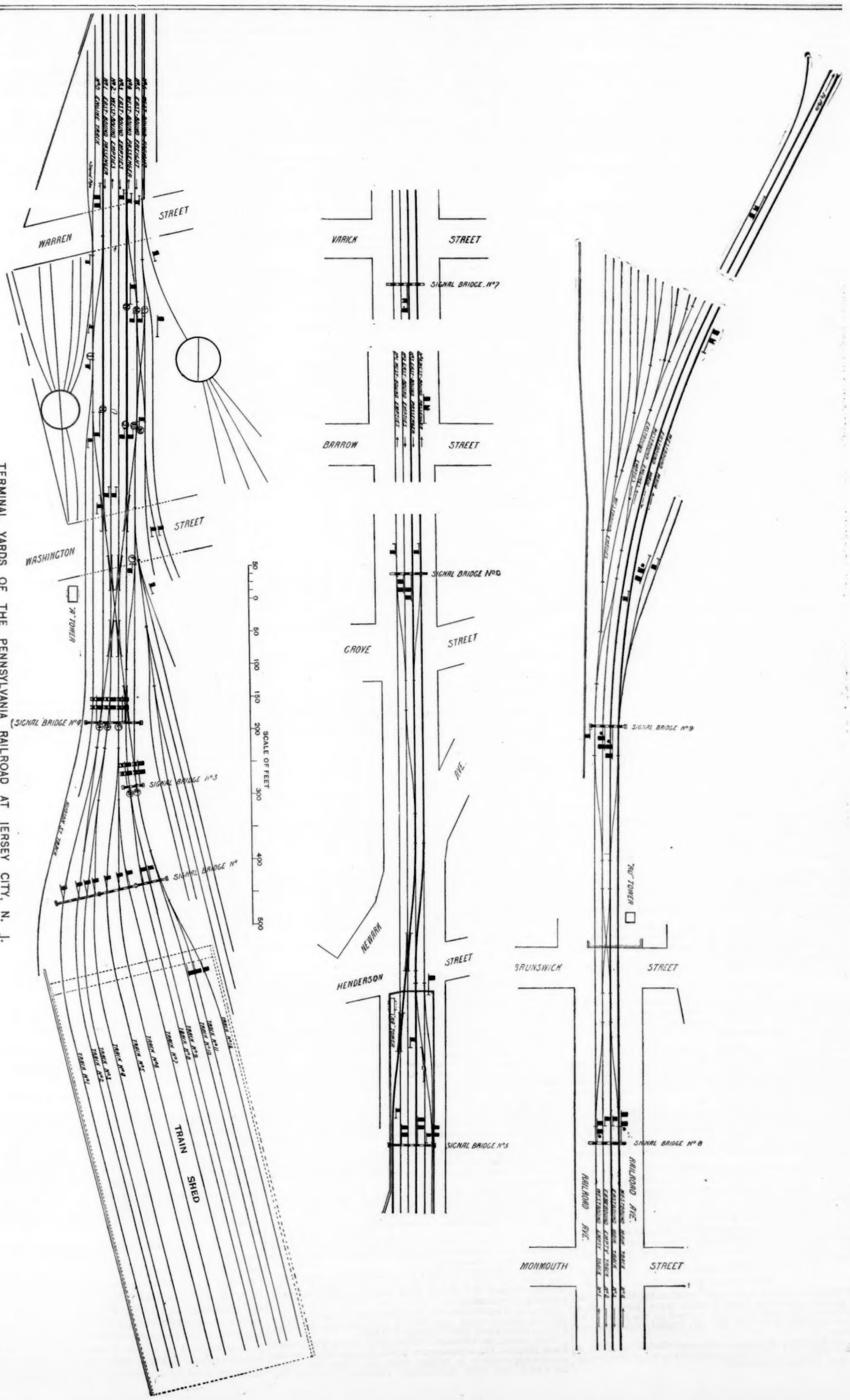
3d, on Texas & Pacific, near Aledo, Tex., a freight train standing at a water tank was run into by a following freight. Eight cars were wrecked, caught fire and were burned up. Two trainmen fatally injured.

5th, on Michigan Central, near Niles, Mich., a freight train with a pusher at the rear broke in two, and the detached portions afterward collided, wrecking 2 cars and damaging several others. A tramp was killed.

17th, on Northern Pacific, near Lister, Wash., a freight train ran into the rear of a preceding freight, wrecking engine and 15 cars and injuring 3 trainmen.

17th, on Chesapeake & Ohio, near Snowden, Va., a freight train ran into the rear of another freight, killing the engineer and fireman.

* An account of the "train describers" was published in connection with a diagram of the Erie interlocking at Jersey City, in the *Railroad Gazette* of May 22.



TERMINAL YARDS OF THE PENNSYLVANIA RAILROAD AT JERSEY CITY, N. J.

The diagram shows all the tracks and signals from the passenger terminus at the Hudson River, westward to the Waldo Avenue Yard, beyond "R U" tower, where passenger trains are laid up. The blank spaces on the diagram between Grove and Barrow, Barrow and Varick, and Varick and Monmouth streets represent short portions of the line on which there are no switches or signals. The tracks shown by heavy lines are the main passenger tracks. The blades of dwarf signals are shown on the diagram of about the same size as those of high signals, but they may be distinguished by the shorter posts.

19th, at 2 a. m., on Wheeling & Lake Erie, near Creston, O., the first of three closely following freight trains broke in two, and a succession of collisions followed, involving all three trains; 2 engines, 2 cabooses and 15 cars were wrecked and 2 men in charge of horses were severely injured.

21st, on New York Central & Hudson River, at South Byron, N. Y., a freight train with a pusher attached was run into by a following freight during a dense fog, wrecking 2 engines and 8 cars.

26th, on Rome, Watertown & Ogdensburg, near Redwood, N. Y., a passenger train ran into the rear portion of a freight train which had broken in two while entering a side track, wrecking the engine and caboose and a number of freight cars. Engineer and fireman severely injured.

And 13 others on 12 roads involving 1 passenger and 19 freight trains.

BUTTING.

3d, on Missouri, Kansas & Texas, near Hartford, Kan., butting collision between a passenger train and a freight train, due to misplaced switch. Engine and forward cars of both trains wrecked and 4 trainmen injured, one fatally.

4th, on Baltimore & Ohio, at Harper's Ferry, Va., in a butting collision between two coal trains the forward portions of both were piled up in a bad wreck, some of which was thrown over against a sleeping car of an express train passing at this juncture, smashing one end of the car. A man riding on the coal train was thrown into the river and drowned.

5th, on Illinois Central, near Duquoin, Ill., butting collision between a freight train and an empty engine, wrecking both engines and a dozen cars. It is reported that the watch of the conductor of the latter had run down and misled him in calculating for a meeting point.

6th, on Illinois Central near Dongola, Ill., butting collision between two freights, wrecking both engines, ditching a number of cars and injuring 3 trainmen.

8th, on Missouri, Kansas & Texas, near Savannah, I. T., butting collision between two freight trains, wrecking the engines and 20 cars, including a tank car loaded with oil. This was ignited and the wreck was burned up. A brakeman and a tramp were either killed outright or burned to death and 6 other trainmen were injured. The two trains had orders to meet at Savannah. One of them arrived there ahead of the other and the runner seeing a work train on the siding supposed it was the train he had orders to meet and neglected to stop.

13th, night, on Michigan Central, near Utica, Mich., butting collision between two passenger trains, due, it is said, to a confusion of orders, wrecking both engines and 12 cars. Brakeman killed.

15th, on Southern Pacific, near Port Costa, Cal., collision between a passenger train and a construction train on a curve, wrecking both engines, a mail car and 10 flat cars. Brakeman and a mail clerk killed and 4 other trainmen and several passengers injured. It appears that the crew of the construction train started from Port Costa under the impression that the passenger train had already passed.

19th, on Illinois Central, near Sauve, La., a passenger train running at high speed struck a misplaced switch at a point where a freight train was set off, making a very bad wreck, in which the mail car was thrown on top of the passenger and freight locomotives and all the other cars derailed and damaged. Five trainmen and one trespasser killed and 4 trainmen badly injured.

20th, on Philadelphia & Reading, near Minersville, Pa., a string of 75 coal cars ran away down a grade and into the head of a freight train, the engine and 18 cars being badly wrecked.

21st, at 3:30 a. m., on Chicago & Alton, near Williamsville, Ill., butting collision between a special passenger train and an extra consisting of two engines and caboose, due to the crew of the latter failing to observe or to heed a flag carried by a preceding passenger train indicating that another train followed. One trainman killed, 2 seriously and several slightly injured.

23d, on New York Central & Hudson River, at White Plains, N. Y., collision between a northbound passenger train and a gravel train, due to the runner of the passenger train failing to observe a flag sent out to stop him. Both engines and a number of flat cars damaged. Five trainmen, 6 passengers and a number of workmen injured.

25th, on Texas & Pacific, near Jefferson, Tex., butting collision between two freight trains, due to one of them pulling out of the station 2 minutes ahead of time. Both engines and 8 cars wrecked. A brakeman and a tramp were killed.

25th, on Old Colony, at Taunton, Mass., butting collision between a passenger train and a switching engine at a point where some new interlocking had just been put in use. Fireman injured.

And 5 others on 4 roads involving 2 passenger and 8 freight trains.

CROSSING AND MISCELLANEOUS.

13th, on Cleveland, Cincinnati, Chicago & St. Louis, at Litchfield, Ill., a passenger train was run into by a freight train at a crossing, wrecking the baggage car and a coach. One passenger fatally and two trainmen severely injured.

13th, 3 a. m., on Louisville & Nashville, near Sebree, Ky., a passenger train running at high speed collided with some freight cars which obstructed the main track at a siding, wrecking the engine and baggage car. Engineer killed, fireman and postal clerk seriously injured, and several passengers bruised.

17th, on Chesapeake & Ohio, near Rope Ferry, Va., a freight train descending a grade broke in two near the engine, and in the attempt to recouple the detached portions they violently collided on a curve, wrecking a number of cars and the engine, and killing the engineer and fireman.

18th, at Millers Falls, Mass., a Fitchburg freight train collided with a Central Vermont switching freight, damaging an engine and injuring engineer and fireman.

29th, on Vandalia line, at Woodbury, Ill., collision between a special passenger train and a freight train entering a siding, damaging the baggage and express cars. The engineer of the passenger train was badly hurt by jumping and several passengers were slightly injured.

And 5 others on 5 roads, involving 2 passenger and 8 freight trains.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on Sandy River road, near Fairbanks, Me., engine and several cars of a freight train were derailed at a point where the rails had been warped by the heat. The engine was tipped over on its side, slightly injuring the engineer.

2d, on Alabama Mineral road, near Talladega, Ala., a freight train was derailed at a defective switch and badly wrecked, killing 3 trainmen.

8th, on Central Vermont, near Malone, N. Y., a passenger train went through a bridge which had been partially burned. The locomotive went down into a ravine, injuring the engineer and fireman.

10th, on East Tennessee, Virginia & Georgia, at Nickajack, Ga., 10 cars of a freight train were derailed by a defective frog and ditched, killing a brakeman.

12th, on Union Pacific, near Havenville, Kan., passenger train derailed by spreading of the rails, the locomotive being overturned and 2 trainmen killed.

15th, on Milwaukee & Northern, at Chilton, Wis., a passenger train was derailed at a point where the rails had been expanded by the heat. Several cars were badly damaged, and 2 trainmen and 8 passengers were injured.

17th, on Chicago, Burlington & Quincy, near Corning, Ia., the engine and 3 cars of a freight train plunged into a creek the bridge over which had been washed away in a cloudburst. The engineer, who jumped and landed in 12 ft. of water, escaped being carried away only after a severe struggle. A passenger train had crossed the bridge only 7 minutes earlier.

22d, on Cleveland, Akron & Columbus, near Barberton, O., several cars of a passenger train were derailed at a defective switch and overturned in the ditch, slightly injuring several passengers.

24th, night, on Burlington & Missouri River, near York, Neb., a freight train went down into a creek the culvert over which had been washed away in a freshet, the engine and 23 cars being piled up in a very bad wreck. Engineer killed, fireman fatally and a brakeman severely injured.

And 10 others on 9 roads, involving 3 passenger and 7 freight trains.

DEFECTS OF EQUIPMENT.

11th, on Manhattan Elevated, in New York City, a Third Avenue passenger train entered the South Ferry station uncontrolled, by reason of the vacuum brakes failing to work, disabling the engine and smashing the bumpers. Most of the passengers were on their feet preparatory to alighting, and many of them were thrown down and a few slightly injured.

11th, midnight, on the Pennsylvania & Northwestern, at Roots Station, Pa., as a coal train consisting of 30 cars, with an engine at each end, was descending a steep grade, the forward coupling of the rear car gave way and the train rushed down the grade at terrific speed to a curve, where it was derailed and thrown into a ravine, making a very bad wreck. Engineer, conductor and a brakeman killed and 3 other trainmen injured.

11th, on Columbus & Western, near Alexandria, Ala., a truck wheel under the engine of a freight train broke while descending a grade. The engine was derailed and broke through a trestle, piling up 11 cars. Three trainmen were injured by jumping.

23d, on Manhattan Elevated, at Christopner street station, on the Ninth Avenue line, New York City, the rear driving axle of an engine of a passenger train broke just as the train was coming to a stop at the station. The connecting-rod was badly twisted but not broken, the wheel lodging on the projecting sleepers.

And 13 others on 10 roads, involving 13 freight trains.

NEGLIGENCE IN OPERATING.

11th, on Cincinnati, New Orleans & Texas Pacific, near New River, Tenn., 4 cars of a freight train were derailed by some machinery falling from a car to the ground. Brakeman injured.

11th, on Duluth, South Shore & Atlantic, at L'Anse, Mich., a freight train descending a steep grade became uncontrollable and 12 cars were derailed and wrecked, as was also a station building struck by the derailed cars. Engineer fatally hurt.

23d, on Georgia Southern, at Sibley, Ga., eight cars of a freight train were derailed at a curve by a hand car, which was thrown to one side by the engine, but fell back under the cars. Engineer and two brakemen injured, the former by jumping.

23d, on Chicago, Milwaukee & St. Paul, near Duplainville, Wis., engine and 18 cars of a freight train were derailed and ditched through a signalman's blunder. Engineer badly scalded and fireman slightly injured.

23d, on San Antonio & Aransas Pass, at Yoakum, Tex., engine and 8 cars of a freight train were derailed at a misplaced switch. The locomotive was overturned, injuring engineer and fireman.

27th, on Louisville & Nashville, near Brown's Creek, Ky., the engine and 13 cars of a freight train were derailed and damaged at a point where track repairs were in progress, slightly injuring 3 trainmen.

28th, on Baltimore & Ohio, near Riverside Park, Pa., a freight train was derailed by a misplaced switch, damaging the engine. Engineer hurt.

And 5 others on 5 roads, involving 4 passenger and 1 freight train.

UNFORESEEN OBSTRUCTIONS.

1st, on Southern Pacific, at El Paso, Tex., a passenger train was derailed at a switch which was maliciously misplaced by a man who was seen by the engineer as the train approached. The engine and 4 following cars were badly damaged and 2 trainmen injured.

4th, on San Antonio & Aransas Pass, near Welding siding, Tex., a freight train ran over some cattle and the engine and 4 cars were derailed and wrecked. Brakeman injured by jumping.

5th, a. m., on Denver & Rio Grande, near Acquia, Colo., a passenger train was derailed at a point where the roadbed had been undermined by water from an irrigating ditch, an adjacent farmer having left his flood gate open during the night. The baggage car and 3 coaches were thrown zig-zag on both sides into the ditch, one of the coaches overturning and landing bottom up. Two passengers were severely and a number of others slightly injured.

8th, on Union Pacific, at Oakesdale, Wash., a special passenger train ran into a house which was being moved across the track, damaging the engine. Fireman injured by jumping.

8th, on Atlantic & Pacific, near Winslow, Ariz., a water train ran over a cow, wrecking 8 cars and the caboose. Two trainmen badly injured.

9th, on Chicago, Burlington & Quincy, near St. Joseph, Mo., the engine and mail car of a passenger train were struck by a mass of earth and rock which was dislodged from an overhanging bluff, derailing and wrecking both and injuring 3 trainmen.

10th, on Southern Pacific, near Copley, Cal., a passenger train ran into and was derailed by a herd of cattle, the engine and 2 forward cars being ditched, slightly injuring 3 trainmen.

13th, on Western North Carolina, near Coopers, N. C., a construction train ran over a cow and was derailed, killing 2 workmen and injuring 8 others.

16th, night, on Chicago, Milwaukee & St. Paul, near Coon Rapids, Ia., a passenger train was derailed on the trestle approach to a bridge over the Coon River by a tie which had been maliciously fastened between the rails. The engine and baggage-car broke through the bridge after running several rods on the sleepers, and the baggage car, 3 coaches and a sleeping-car were tipped sidewise off the trestle, falling about 40 ft. Two passengers and an express messenger were killed and 9 trainmen and 11 passengers injured.

17th, on Atchison, Topeka & Santa Fe, near Marceline, Mo., a wrecking train was derailed and ditched by running over a cow, killing an employé and injuring 4 others.

19th, on Valley road, near Canton, O., the engine and 13 cars of a freight train were derailed and badly damaged at a point where sand and rubbish had been washed upon the roadbed by heavy rains. Engineer badly hurt by jumping.

19th, on Kansas City & Southern, near Osceola, Mo., a passenger train was derailed and ditched at a point where the roadbed had been impaired by heavy rains, killing the engineer and a man riding on the engine and injuring several passengers.

23d, on Northern Pacific, near Rosebud, Mont., a passenger train was derailed at a washout and the rear sleeper thrown down a bank into the Yellowstone River. A number of passengers were slightly injured, and many others had narrow escapes from drowning.

And 7 others on 7 roads, involving 2 passenger and 5 freight trains.

UNEXPLAINED.

6th, on Cincinnati, New Orleans & Texas Pacific, near Cumberland Falls, Ky., an engine and caboose running backward were derailed and considerably damaged. Conductor and fireman injured.

6th, on Cleveland, Cincinnati, Chicago & St. Louis, near Elizabethtown, O., engine of freight train was derailed and went over an embankment, killing the engineer.

9th, on Central New England & Western, at West Winsted, Conn., a freight train was derailed, wrecking several cars and injuring a brakeman.

10th, on Chicago & Erie, at Huntington, Ind., a freight train was derailed and several cars wrecked, killing a brakeman.

10th, on International & Great Northern, near Neches, Tex., 7 cars of a freight train were derailed and wrecked, injuring a brakeman. Fifty head of cattle were killed and many others maimed.

10th, on Columbus & Western, near Dodeville, Ala., engine and 9 cars of a freight train were derailed and wrecked, slightly injuring 2 trainmen.

11th, on Cleveland, Cincinnati, Chicago & St. Louis, near Galion, O., a passenger train was derailed, disabling the engine and damaging several coaches. A number of passengers were slightly injured.

12th, on Union Pacific, at Savannah, Kan., a passenger train was derailed and ditched, injuring engineer and fireman.

12th, on Knoxville, Cumberland Gap & Louisville, at Cloud Station, Ky., 3 cars of a freight train were derailed and wrecked, killing 1 trainman and seriously injuring 2 others.

21st, on New York, Chicago & St. Louis, near Dover, O., an excursion train, the engine of which was running tender first, was derailed, the locomotive being overturned and the 7 following cars thrown across the track in various directions. One of the cars broke in two and the others were badly smashed. One passenger killed and about 30 passengers injured. One of the tender wheels was found broken after the accident.

22d, on Richmond, Nicholasville, Irvine & Beattyville, at Million, Ky., a construction train was derailed and wrecked, killing 4 employés and injuring 6 others.

22d, on Union Pacific, near Boulder, Colo., the tender of the engine of a passenger train, which was moving tender first, was derailed, and, together with the engine, went over a retaining wall into a creek.

23d, on Atchison, Topeka & Santa Fe, near Thomas, Kan., a passenger train was derailed. The locomotive was overturned, killing the fireman and badly injuring the engineer.

25th, on St. Louis, Iron Mountain & Southern, near Van Buren, Ark., the rear car of an excursion train was derailed and overturned, killing an infant and injuring conductor and about 20 passengers, some of them severely.

27th, on St. Louis, Alton & Springfield, near Waverly, Ill., several cars of a freight train were derailed. A brakeman who jumped off was instantly killed.

30th, on Western North Carolina, near Newton, N. C., the caboose and several cars of a freight train broke through a high trestle and fell into a ravine, killing a brakeman and injuring 2 other trainmen.

And 25 others on 23 roads, injuring 4 passenger and 21 freight trains.

OTHER ACCIDENTS.

29th, on Cincinnati, New Orleans & Texas Pacific, at Sadieville, Ky., side-rod of locomotive of a passenger train broke, injuring engineer and fireman, and knocking a hole in the boiler.

29th, night, on Central of New Jersey, near Nesquehoning Junction, Pa., a yard engine with a string of freight cars exploded its boiler, instantly killing 4 trainmen.

And 6 others on 6 roads, involving 4 passenger and 2 freight trains.

A summary will be found in another column.

The New Stock Yards Near Chicago.

The property of the Union Stock Yards Company, at Chicago, located in the southwest part of the city, some little time since passed into the hands of an English syndicate at a figure which represented a fair investment, taking as a basis the profits of the former company. The interests transferred consisted mainly of the ground occupied by the yards, the buildings and privileges, and the rolling stock, tracks and rights of the Transit company which did all the switching in the district.

The space and the facilities for handling material here have long been looked upon by several of the larger packers as very much cramped and entirely inadequate for their needs, and especially for any enlargement of their plants in the near future. In view of the fact that the encroachments of the city were becoming serious, and on account of necessary sanitary restrictions and the inability of the companies to meet these requirements, it was decided to obtain a large plot of ground elsewhere, at some distance from the heart of the city, and where railroad accommodations should be ample for an

extended growth. Water transportation was a prime consideration in such a selection, and no site seemed to offer which would better fill the conditions than the district along the shore line toward the head of Lake Michigan. The Calumet Basin, about which so much has been said for the past few years on account of the government harbor appropriations, originally had a southern outlet through what is termed the Grand Calumet River, which meanders about considerably, but whose general direction is toward the east. The banks of this river vary in distance apart from 600 to 1,200 or 1,500 ft., the bed being filled up to the surface of Lake Michigan with black loam, which is from 15 to 25 ft. deep. The stream itself is small, and runs from side to side of the river bottom, and of late years the outlet to the east has been closed by the formation of a bar across the mouth. The bottom of the lake at this end slopes down gradually to four or five fathoms at several hundred feet from shore then to 9 or 10 fathoms at about two miles out, remaining about 10 or 11 fathoms for over 10 miles out, the bottom being sandy, with spots of clay.

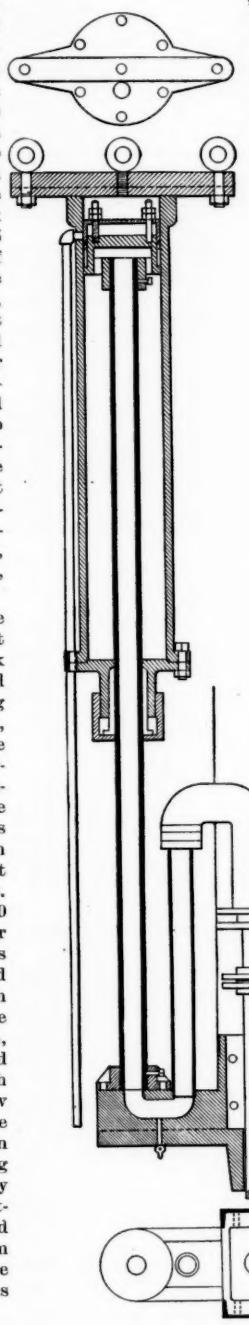


Fig. 2.

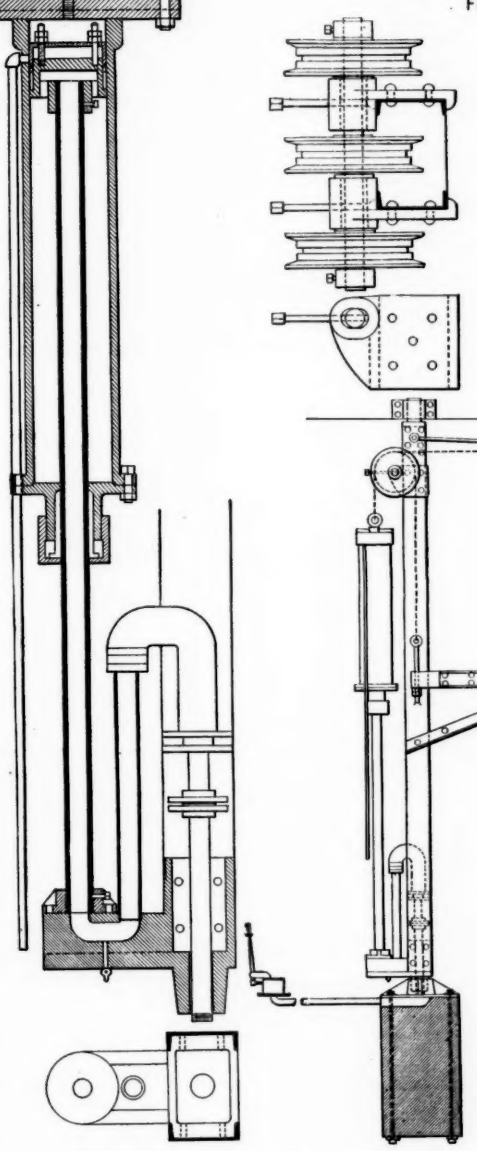


Fig. 1.

A tract of land on the lake shore, at a point just east of the old government mark locating the extreme head of the lake, and covering eight fractional sections, was purchased by the three large packers, Armour, Morris and Swift, with the intention of establishing here a stockyard, packing plants and tanneries, together with the other industries incident to the packing interests. This property covers 3,950 acres and was purchased for $1,000,000. The main lines of the Baltimore & Ohio and Lake Shore & Michigan Southern cross its entire length, and the Pittsburgh, Fort Wayne & Chicago and Michigan Central cross each other about 1,000 ft. below the southwest corner. The Elgin, Joliet & Eastern (outer belt line) is extending its track into the property from near Hobart. This latter road taps every railroad running into Chicago, from all directions, so that the best of railroad facilities will be had here.

The ground as it now lies is a succession of sand dunes rising in places above the lake level a considerable height. The general trend of the ridges is parallel to the shore line, the whole being overgrown with oak, cottonwood and underbrush. These sand hills are so large that a good deal of grading will be required to put the ground in a condition suitable for buildings and streets. It is the intention to cut through from the river to the lake at a point about a mile west of the east boundary line. This canal is to be 125 ft. wide at the bottom and to have a depth of water of 20 ft. (which is three or four feet more than in Chicago harbor). In order to obtain this depth it is necessary to dredge out into the lake 1,500 ft. and run out two piers, one on either side. The west pier will probably be much longer than the east, as there is a tendency on this side of the lake and part way across the lower end for the sand to crowd up against the north or west side of a pier and to scour out from the south or east side—this on account of the prevailing heavy seas being from the northeast. On the east side of the lake these conditions are of course reversed. The profile of the ground where this channel is to pass is such that the excavations will amount to about 700,000 cu. yds.

At the south end of the canal the course of the river is such that several basins can be laid out in the form of parallelograms, with 300 ft. channels between. The first basin is 1,000 × 2,400 ft., with slips all across the east end, the second and succeeding basins having slips along the sides, thus giving a maximum capacity for the available acreage.

It is proposed to locate the stockyards proper on Section 3, the pens to be arranged in the circular form, with space for offices and sheds at the centre. A double track is to extend around and inclose the yards, the outside track to be used exclusively for a running track and to have switches at intervals connecting with the inside track, and on which the cars will be run for unloading, this inner track being next to the platforms. Traffic on both tracks will pass in one direction only.

The exact locations of the various buildings for the different departments have not been as yet decided upon, as at present the main work in hand is the grading of portions of the property, there being about 1,300,000 yds. of excavation also to be made for the waterways. The ground lying south of the river is to be reserved largely for the use of the packers, whereas that to the north will be disposed of to a number of other industries, which it is expected will take this opportunity to obtain good harbor facilities without the attendant high rentals and long hauls incident to the sites along the Chicago River.

This locality was that selected in the old government report for the establishment of a harbor of refuge, and agitation has been recently renewed concerning the obtaining of an appropriation for building such a place for vessels driven by the northeast storms past the Chicago port and up to this end of the lake. Some people expect that aid in this direction will be had in the near future, but it is as yet uncertain, and those interested here are not putting much dependence on any such prospects.

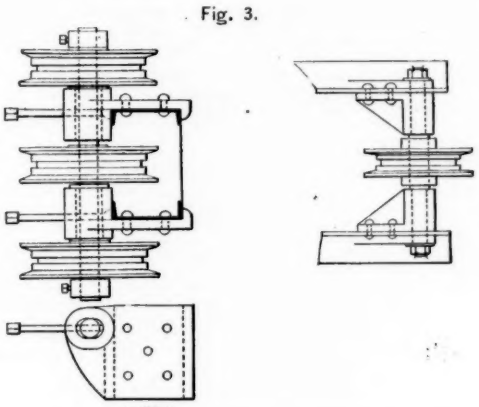
The Ridgeway Balanced Steam Hydraulic Crane.

The illustrations herewith presented show an elevation and details of a pressure crane, acting through the use of a head of water alone, taken, for instance, from city water-works pressure or by means of a combination of steam and water, the steam pressure acting upon an inclosed mass or piston of water. The usual pumps and accumulators are done away with, being in no way necessary to its operation.

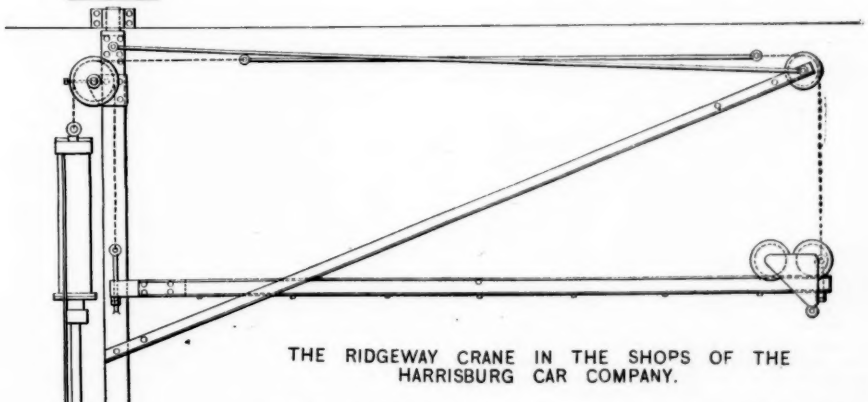
The crane illustrated is one devised for use in the Harrisburg Car Company's shops at Harrisburg, Pa., and to be operated by city water pressure.

Fig. 1 shows a side elevation of the crane, fig. 2, an enlarged detail view of operating cylinder and attached mechanism and fig. 3 is an enlarged view showing relative location of chain wheels. The crane proper is quite simple in construction, being made up of channel and angle irons laid in pairs. It is centred at top and bottom. Inclined braces and rods support out-board chain wheel bearings, while in-board bearings are securely attached to the mast as high up as possible. A horizontal lifting jib is suspended by means of a pair of chain wheels and chains at the mast bearings and by a central chain wheel and chain at the out-board bearings. Upon this horizontal lifting jib the trolley moves to and fro for changing the location of the load. To the combined opposite ends of the three chains supporting the horizontal trolley jib is attached a cylinder adapted to move up and down upon a piston and rod by means of pressure brought to bear within. This piston and rod act as a guide to the up-and-down movement of the cylinder, and being made hollow is used as a means for transmitting the necessary operating pressure to the inside of the cylinder. The cylinder is freely suspended from the chains to permit of an easy movement up and down the piston rod. The cylinder is made sufficiently heavy to counterbalance the trolley jib. Fig. 2 shows in detail the method of effecting the transmission of pressure to the inside of the operating cylinder. The bottom step of the crane is made hollow to receive the pressure at its centre and transmit it through extension joints to the bottom of the hollow piston rod. A stuffing box is provided to permit the crane to revolve about the central admission tube. To admit air to, or drain the upper end of, the moving cylinder of any chance accumulation of water a pipe is connected as shown. A small gate valve is shown to the left of the step of crane in fig. 1 for controlling the admission of water pressure to the crane.

Fig. 3.



Where a combination of steam and water is to be used, a special extra water cylinder is also used, set partially or wholly below floor level. This water cylinder is filled up to within a foot of its top, and air permitted to occupy the balance of the space. A steam valve is located at the top of this extra cylinder, through which when pressure is desired, steam is admitted. Steam pressure being admitted to the cylinder acts upon the air and upon the upper surface of the water to press it to a lower level. This pressure is at once transmitted to the lifting cylinder, moving it downward and effecting by such operation the lifting of the load attached to the trolley of the horizontal lifting jib of the crane. When the load is to be released the admission of steam is stopped and that remaining in the cylinder is exhausted allowing the water to flow back, permitting the hoisting cylinder to rise and the load to move down. The water is used over and over and does not require to be renewed. The admission of steam to the water cylinder, as also the admission of the water to the hoisting cylinder, is controlled by valves to regulate the speed of hoisting, and after a similar manner the lowering of the load is effected at a fast or slow speed by an increased or decreased opening of the valve.



THE RIDGEWAY CRANE IN THE SHOPS OF THE HARRISBURG CAR COMPANY.

The crane is protected by patents to H. Ridgeway, C. E,. and is manufactured by Craig, Ridgeway & Son, of Coatesville, Pa.

Australian Brake Trials.

The following is the substance of the report of the board appointed by the South Australian Government to inquire into the comparative merits of the Westinghouse compressed-air and other compressed-air and vacuum brakes. The members of the board were: Messrs. L. Grayson, M. P.; Thos. Roberts, Locomotive Engineer, South Australian Railways; J. Quan, Manager Glenelg Railways; Allison D. Smith, Acting Locomotive Superintendent, Victorian Railways, and D. H. Neale, Railway Inspector, New South Wales Railways.

The trains to be tested were to be similar in all respects, to consist of not less than 50 vehicles of all classes and to be tested on the narrow-gauge tracks. Brakeshoe pressures were not to exceed 95 per cent. of the weight on engine and tender wheels (except leading truck wheels) or 100 per cent. on wheels under other vehicles of the train when said vehicles were empty; but one brakeshoe to each wheel was permissible except on the engine and tender, and the entire mechanism tested must be such as was intended for general use.

The trials were to be made first with brakeshoes hanging ¼ in. from the wheel tread, and then with the shoe 1 in. from the wheel tread, to represent the efficiency of the brake with half-worn shoes.

Four companies declared their intention of entering the competition. They were the Vacuum Brake Co., the Westinghouse Brake Co., the Eames Vacuum Brake Co. and Messrs. Tadman & Barling. The last two companies, however, made no preparations for the tests. The representative of the Vacuum Brake Co. assented to all the conditions under which the tests were to be made and declared his company's willingness to compete in the trials. Two months afterward, however, he addressed a letter to the South Australian Government stating that his company objected to the conditions of tests and would take no further action in the proposed competition. The board, however, decided to make tests of the Westinghouse brake.

The track where the tests were made was marked out as follows: On three separate portions of the line three posts were set up, marked respectively *A*, *B* and *C*. The distance between posts *A* and *B* was an accurately measured half-mile, and the distance from *B* to *C*, which was 1,000 yds., was divided into 30 spaces marked by intermediate posts, each representing 100 ft. The following are in part the rules adopted by the board:

4. To take the speed at the time of applying the test an observer stationed upon the engine will give an electric signal to the van containing the recording instruments when the trailing wheels of the engine are abreast post *A*, and the driver, having run the distance from *A* to *B* at an even rate of speed, will apply the brake when the centre of the trailing wheel is opposite the stop post *B*. The time of passing posts *A* and *B* to be accurately taken by an observer on the engine.

5. At the instant that the train comes to a standstill the observer on the engine will again, with the stop-watch, record the time taken to bring the train to a stand.

6. The observers in the vehicle next the engine, immediately the train has come to a stand, will measure the distance from the centre of the engine trailing wheel to the nearest marked distance post, thus obtaining the distance in which the stop was made.

7. The observer on the engine will note the steam pressure and air pressure immediately before the application of the brake, and also after its release. He will also note the influence of the application in the air gauge.

8. A recording apparatus is placed in a vehicle at the rear end of the train, and will record graphically and automatically the movement of the driver's handle, the consequent change of pressure in the pipes and cylinders, and the time elapsing between the movement of the driver's handle and the full application at the rear of the train. It will also graphically record the time taken to release the brake and the speed and distance run.

9. The competitor shall declare his regular working pressure and leverage, in which no subsequent alteration must be made, and hand in drawings of the brake gear and fittings.

10. The running and working of the train shall be done solely by the driver, fireman and two guards, and no one else must assist or obstruct them in this duty.

11. The brake must be applied and released by the driver only, except where specially otherwise provided in these conditions.

12. Sand must not be used in any of the tests except in an unforeseen emergency.

13. Hand brakes must not be used in any of these tests unless specially called for by the driver.

The experimental train was made up as follows:

	Weight, lbs.
Engine (14½ by 20-in. cylinders, 6 drivers with leading truck)	56,200
Tender (6-wheeled)	38,080
20 goods wagons (4-wheeled) loaded	384,665
20 " " " partly loaded	316,315
7 " " " empty	56,667
3 carriages, bogie (8-wheeled) loaded	88,060
1 brake van (4-wheeled) loaded	25,340
Total weight of train	965,335

The board also specially directed its attention to the following points in regard to the Westinghouse brake:

(*a*) Complexity, especially of the triple valve, and consequently liability to become injured by dust and grit.
(*b*) Graduating power.
(*c*) Liability to become exhausted by repeated application.
(*d*) Time taken to release.
(*e*) Frequency of burst hosepipe.
(*f*) Liability of pump to fail.

Some of the conclusions of the board follow:

The point (*a*) cannot be adequately tested in a trial of limited duration, but can be conclusively shown by extended experience, and we find on examining the Board of Trade returns of brake failures in Great Britain that failures of mechanism through grit, dust and the presence of other foreign matter are exceedingly rare with the Westinghouse brake. In 1889, when 44,000,000 train miles were run with this brake, only one failure of this class is recorded—a pipe on a tender being partly blocked through excessive use of oil having destroyed the inner layer of rubber in the hose coupling. This immunity from trouble from dust or dirt is due to the principle on which the brake works.

On the points (*b*), (*c*) and (*d*) the brake was subjected to the most severe tests we could devise. Repeated trials proved that a train heavy enough to require three engines on an ascending gradient could be safely taken down the steepest gradient on the narrow-gauge lines of the colony—1 in 61—by one engine, the brake power being entirely under the control of the driver, who could regulate the speed and stop when required. In one case, when descending this incline at an average speed of 15 to 16 miles an hour, a mob of cattle crossed the track directly in front of the engine. The driver immediately applied the brake with full force, stopping the train clear of the cattle—a stop impossible with the hand brakes at present in use, unless a number of brakes had been pinned down before leaving the summit. On the following day, when descending this gradient at 38 miles per hour, the train was stopped at a distance of 675 ft., as recorded by the indicator, showing the control the driver had over the train even when running down a steep gradient at a rate of speed which is considerably in excess of that allowed by the department.

The point (*c*)—liability to become exhausted by repeated application—was tried both by running down inclines and repeatedly applying the brake, and also by applying the brake at intervals of 30 seconds when a train was standing in a siding. In the former tests the pressure at the foot of the incline was invariably higher than at the summit, showing that the brake gained rather than lost power. In the latter test the pressure in the train pipe fell 5 lbs. in six minutes, and on making a stop with the diminished pressure the train was stopped in 570 ft. when running down an incline of 1 in 80 at 34½ miles per hour, showing ample reserve power.

Point (*d*)—The release was quickly effected, the brake-blocks coming off all the wheels and the train starting from a state of rest in three seconds after the driver moved his handle to the release position.

Point (*e*)—The hose pipes do not frequently burst in Australia, and such failures may be minimized by the use of the highest quality of hose manufactured.

The point (*f*)—liability of the pump to fail—is reduced to a minimum by a systematic periodical inspection, as is proved by the small number of cases reported to this board or in the Board of Trade returns of England.

As the importance of the two latter points cannot be ascertained in trials of short duration, the conclusions of the Board are based on evidence obtained from the experience of the locomotive departments of South Australia and Victoria. In the former colony three hose pipes burst in the last 12 months, and in the latter eight.

The brake was especially tested in the following respects:

(*a*) *The stopping power in an emergency* on the longest trains at maximum speed as shown in tests 1, 4, 5, 9, 14, 16, 19 and 20.—These tests, contrasted with the hand-brake test No. 21 show, that the train could be stopped in less than one-fourth of the distance on the level with continuous as against hand brakes.

(*b*) *Efficiency of the Brakes when the Parts have become Worn.*—All tests were made with the blocks hanging at least 1 in. from the wheel, representing a worn block.

(*c*) *Efficiency of the Brake should a Coupling Part.*—This was tested on various speeds on the level and on up gradients of 1 in 80 and 1 in 61. In all cases both portions of the train were brought to a stand in short distances, and in all cases but one a space of several feet separated the two parts of the train when they came to rest. In one test the two parts came together, but not violently. (See tests 2, 7, 10, 15 and 18.)

(*d*) *Graduating Power.*—This was tested by running a train down inclines of 1 in 61 and 1 in 80, and by making an ordinary service stop at Jamestown to bring the carriages exactly opposite the station. The speed of the train appeared to be easily regulated. On the first day of the trials several shocks were felt, but on the second and third days a great improvement in the graduating power was observed, showing that the train was under thorough control.

(*e*) *Time Taken to Release.*—This was carefully ascertained when the train was standing in the siding. The time taken was remarkably short, not exceeding three seconds.

(*f*) *Time Taken in Shunting.*—The result of this test proved that, with expert shunters, the time taken to shunt trucks fitted with the brake would be practically equal to that taken with wagons fitted with the ordinary hand brake.

(*g*) *Consumption of Steam in Working the Brake.*—This test was not of a conclusive nature, but evidence from engine drivers goes to show that the steam used is not appreciable.

(*h*) *Liability to Leakage and Difficulty of Detecting Leakage.*—A pressure gauge was applied to the cylinder of the brake van only, which was found to leak off in 15 min. With one exception all the other brakes in the train remained on at the expiration of half an hour. The pressure during this latter period was reduced in the brake-van reservoir from 57 lbs. to 26 lbs. In the cylinder the pressure fell from 47 lbs. to zero in 15 min., and in the train pipe in the brake van from 59 lbs. to 25 lbs. in 30 min.

There were several leaks in the train pipe, which might have been easily remedied if thought necessary. There was also a serious leak in the main reservoir on the engine, due to defective workmanship.

The times, distances, pressures and speeds were taken by Kapteyn's automatic recording apparatus, which, by means of several Richards' indicators, automatically drew diagrams of the pressures and speeds on an endless sheet of paper driven from an unbraked axle of the rear van. These diagrams gave the distance traveled by the train. The time was shown by a clock in connection with an electric contact apparatus marking the paper at intervals of two seconds. The movements of the driver's brake valve on the engine were similarly shown, each movement making and breaking an electric contact, the engine and apparatus being electrically connected by a wire along the train. Telephonic communication between the engine and the rear van was found convenient, but was not used in making records of the results of the tests. The instrument was in the sole charge of Mr. Oxlade, representing Messrs. H. H. Kingsbury & Co., electrical engineers, of Sydney, New South Wales.

In the accompanying tables appear the results of the emergency and breakaway stops.

In closing its report the Board affirms that "a continuous brake is necessary and should be fitted with the least possible delay to all rolling stock. The Westinghouse brake is already in considerable use in the three colonies of South Australia, Victoria and New South Wales. The Board is of opinion that the brake which they have subjected to such severe tests is an excellent one, and likely to prove satisfactory in actual service. The Board therefore recommends the adoption of the Westinghouse quick-acting automatic brake as the standard brake for the colony, or any other that may afterward be proved to be superior that will couple and work with it."

Two of the members of the Board, Messrs. Roberts and Quan, dissented from part of these conclusions and recommendations. The former recommended that the Westinghouse automatic quick-acting brake be applied to all the 5 ft. 3 in. gauge rolling stock, and that the adoption of a standard brake for the 3 ft. 6 in. gauge lines be deferred until the completion of the competitive trials soon to be made in New South Wales. Mr. Quan recommended that the Westinghouse ordinary automatic brake be adopted as the uniform standard continuous brake for the South Australian railways, but that ordinary hand-brakes only be used in goods and mineral

BREAKAWAY TESTS.

No. of Test.	Date, 1890.	Speed, miles per hour.	Gradient.	Distance run to stoppage of rear portion of train. From coupling being slipped. Secs.	Ft.	From hose pulling apart. Secs.	Ft.	Distance between two portions when train came to a stand.	No. of vehicles in train.	No. of vehicles attached to engine.
2	Oct. 9.....	6	up 1-80	....	....	....	2.0	12 ft. 10 ins.	50	22
7	Oct. 9.....	5	up 1-61	8	....	....	1.6	8 ft. 7 ins.	46	21
10	Oct. 9.....	25 (?)	level	....	218	13	....	touched.	46	21
15	Oct. 10.....	21½	up 1-80	....	....	....	105	37 ft.	30	18
18	Oct. 10.....	14	up 1-61	....	....	5	68	18 ft. 10 ins.	30	18

TABULATED STATEMENT OF BRAKE TESTS, CONDUCTED BETWEEN PETERSBURG AND JAMESTOWN, ON THE SOUTH AUSTRALIAN RAILWAYS.
EMERGENCY STOPS.

No. of test.	Date, 1890.	Speed, miles per hour. Previous quarter mile, Observers.	When brake was applied, Instrument.	Time from driver moving handle, seconds. To full stop.	To brake going on in rear van.	To brake being full on in rear van.	Distance, ft. Measured by tape.	Recorded by instrument.	Gradient.	Pressure of air, lbs. Train pipe, Engine.	Train pipe, Rear van.	Cylinder rear van.	Train. No. vehicles, including brake van.	Total w'ght, tons	Total l'ngth, ft.	Percentage of w'ght brak'd.	‡ Equivalent percentage of retardation on level. On whole train, %	On braked weight, %	Equivalent distance in which a similar train could be stopped when traveling at 40 miles per hour down a gradient of 1-60.
1	Oct. 9..	30.0	32.0	13½	1¼	2½	395	376	level	57	53	45	50	415	942	58	9.67	16.67	710
4	Oct. 9..	34.3	35.0	18	1½	2¾	559	585	down 1-61	60	60	48	50	415	942	58	9.07	15.64	768
5	Oct. 9..	35.0	35.5	18½	1¾	2¾	580	615	down 1-61	56	55	45	50	415	942	58	8.92	15.38	783
9	Oct. 9..	30.0	....	12½	...	...	343	...	level	57	55	..	46	390	876	59	9.31	15.78	744
14*	Oct. 10.	33.3	33.5	14	...	...	390	405	level	55	53	44	30	289	609	65	9.84	15.14	695
16	Oct. 10.	38.0	38.5	21	1	2½	643	675	down 1-61	55	65	44	30	269	609	65	9 43	14.51	732
19†	Oct. 10.	34.5	34.8	19½	1	2¼	570	588	down 1-80	50	50	40	30	269	609	65	8.56	13.17	824
20	Oct. 11.	31.5	33.5	13	1	2¼	377	375	level	57	55	46	30	269	609	65	10.63	16.35	634
21	Oct. 11.	32.0	....	64	...	...	1,683	. ..	level	H'd br'ks only used.			30	269	609	18	2 16	12.00	11,592

* Brake applied from rear van.
† Pressure same as after exhaustion test No. 11.
‡ The influence of the revolving parts has been allowed for in calculating the percentage of retardation.

All trials were made with brake blocks hanging at least 1 in. from wheels, so as to represent the effect with worn blocks.

The boiler pressure was about 120 lbs. per sq. in. in all cases.

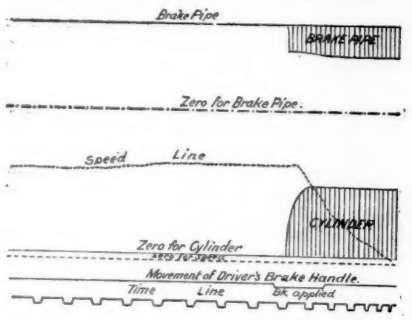
The average results obtained in all emergency stops where both methods—observation and instrument—were employed, are as follows:

	Speed, miles per hour.	Distance of stop, ft.
Observation	34.1	502
Instrument	34.7	517

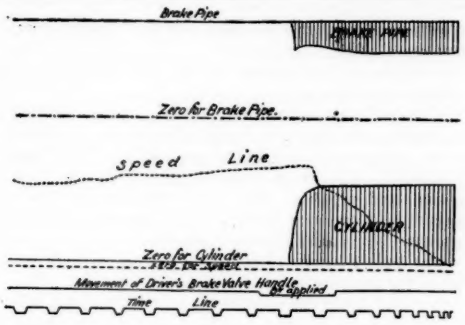
The speed given by the instrument is that immediately preceding the stop, when, especially on falling gradients, the train is gaining speed.

The speed as taken by observers is that in the ¼ mile preceding the stop, when the train has generally not reached its highest velocity. The speed obtained by the latter method is therefore somewhat lower.

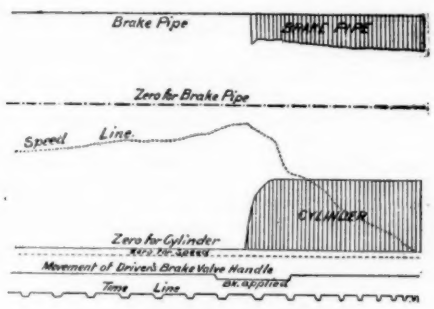
The distance obtained by the instrument is electrically recorded from the first movement of the driver's handle, while the distance as measured by tape is taken from the stop post at which the brake should be applied. In this case, however, the driver appears to have applied his brake on the average about ½ second before being exactly abreast of the stop post, the longer distance given by the instrument being the more correct.



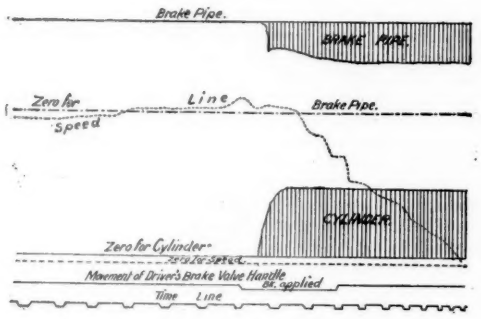
No. 1. Train of 50 vehicles on a level. Oct. 9. Emergency stop.



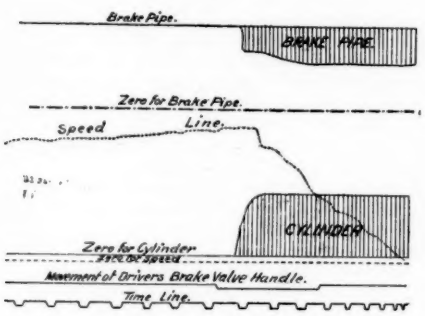
No. 4. Train of 50 vehicles down 1 in 61. Oct. 9. Emergency stop.



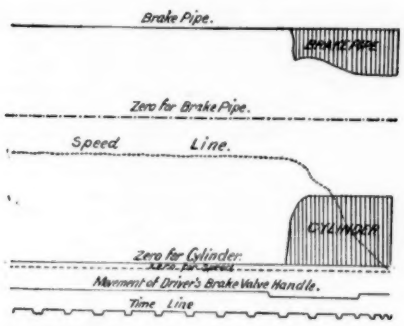
No. 5. 50 vehicles down 1 in 61. Oct. 9. Emergency stop.



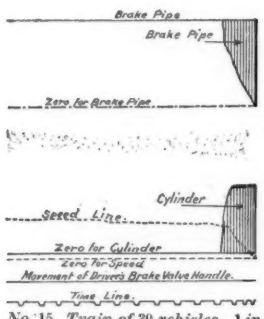
No. 16. 30 vehicles down 1 in 61. Oct. 10. Emergency stop.



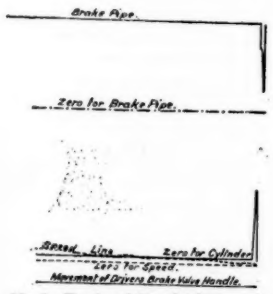
No. 19. 30 vehicles down 1 in 80. Oct. 10. Emergency stop.



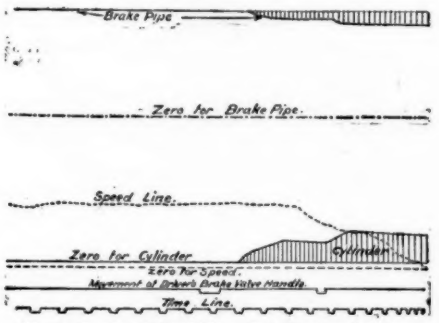
No. 21. 30 vehicles on a level. Oct. 11. Emergency stop.



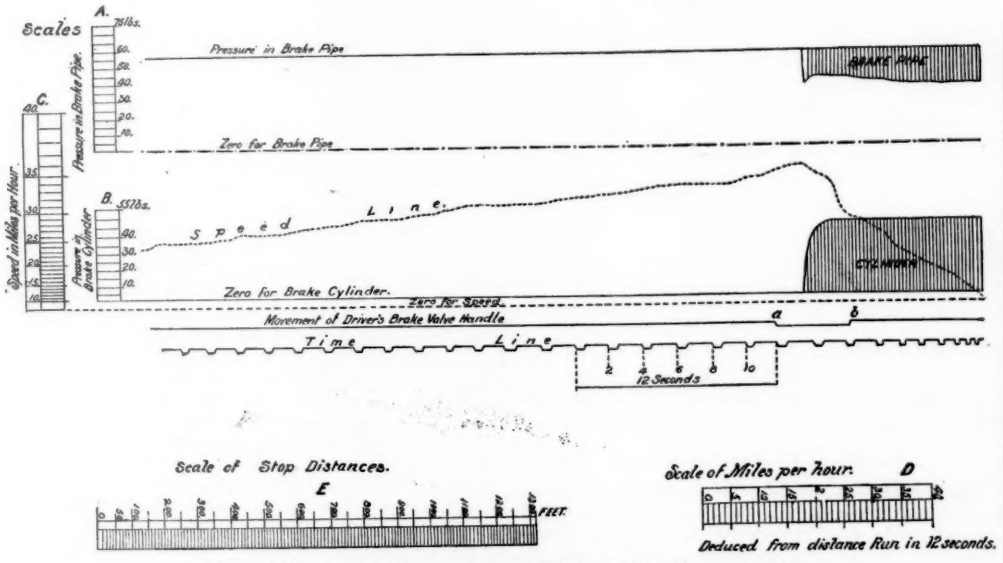
No. 15. Train of 30 vehicles. 1 in 80 up grade. Breakaway stop.



No. 2. Train of 50 vehicles. 1 in 80 up grade. Oct. 9. Breakaway stop.



No. 17. Train of 30 vehicles. Oct. 10. Service stop.



No. 5. Enlarged. 50 vehicles. Down grade 1 in 61. Oct. 9. Emergency stop.

BRAKE DIAGRAMS FROM KAPTEYN'S RECORDING APPARATUS IN REAR VAN—AUSTRALIAN BRAKE TRIALS.

Explanation of Diagram, No. 5 Stop.

1. On referring to Scale A it will be seen that while the train was in motion there was a pressure of 55 lbs. in the brake pipe at the rear van.
2. At point *a* the driver opened the valve to apply the brake, and shut it again at *b*, thus causing a reduction of 20 lbs. pressure in the brake pipe.
3. The pressure in the cylinder immediately rose to 45 lbs. See Scale B.
4. The time line shows that 1¾ seconds elapsed between the movement of the brake handle on the engine and the action of the brake commencing on the van in the rear of the train.
5. On referring the length of the indications made every 2 seconds to Scale D, it will be seen that the speed was 35.5 miles per hour.
6. The speed line, when the brake was applied, referred to Scale C, also shows 35 miles per hour.
7. The stop distance, measured between *a* and *c*, referred to Scale F, shows 205 yards, and is the distance the train traveled after the driver moved the brake-valve handle on the engine.
8. The "speed line" is not so reliable as the "time line," and the indications of the latter have been preferred in determining the correct speed. The "speed line" is produced by somewhat complicated mechanism, while the "time line" is produced by a chronometer making marks by electric contact on an endless band of diagram paper driven from the van axle—a simpler and more reliable method, though the line produced is less graphic than the speed line, which shows clearly the fluctuations of the speed of the train. The speed shown by the time line coincides closely with that obtained by stop watches on the quarter-mile posts. When running on the level the speed of the train before the stop was made was fairly constant, but when running down an incline the speed of the train was naturally constantly accelerating, and consequently the speed obtained in the quarter mile preceding the stop post was less than the speed obtained in the 12 seconds preceding the arrival at the post B where the brake was applied. Consequently in the stops on the level the speeds given by the recording instrument agree with those obtained by observers with stop watches, while in stops made on falling gradients the acceleration of the speed of the train is shown by the higher speed obtained by the instrument in the 12 seconds just before the stop post as compared with the speed obtained by the observer with a stop watch in the previous quarter mile. In one case the speed was obtained in the 1,320 ft. preceding the application of the brake, while in the other it was obtained in about the last 200 to 600 ft. run before arriving at the stop post B, where the brake was applied.
9. The square depressions show the movement of the driver's handle in applying the brake, while the V-like depressions show the movement in the contrary direction to release the brake. Their effect on the air pressure is very apparent, while the effect on the speed will be seen by noticing the length of the intervals on the "time line."

traffic. His reason for favoring the ordinary automatic brake over the quick-acting was that the lightly constructed rolling stock of the narrow-gauge lines would be much damaged by the universal adoption of the quick-acting brake.

Shop Notes—Baldwin Works.

The Baldwin Locomotive Works have just completed the order for 10 consolidation engines for the Western New York & Pennsylvania Railroad, the last one of which was ordered to be compounded. This engine was shipped on Monday last with a corps from the Baldwin test department to examine the efficiencies of the ordinary and compound in the same class of work. Mr. Allen Vail, Master Mechanic of the road, accompanied the engine. As this is the first engine to have the new design of crosshead for the Baldwin compound, it is an object of especial interest. It also has the wrought-iron pistons, and is the most advanced compound which the Baldwin works have yet turned out.

The new crossheads are made of cast steel or wrought iron at present, but, as it has been found to be feasible to make them of wrought iron in an improved way, they will all be made of that material hereafter. Without any question they are the lightest crossheads yet built, and withal they are strong and durable. The wings are placed in a manner not unlike those for the common four bar guide, but in this case the wrist pin is in the centre of the guides vertically. The wings are longer than usual, and are covered with a layer of block tin about $\frac{1}{16}$ of an inch thick, and they are bored out with a 2-in. or larger hole the whole length to reduce the weight. The piston rods, of which there are two for each crosshead on this type of compound, pass through the hubs of the crossheads above and below the wings, and are secured by nuts and split pins on the back sides of the hubs. The wings are of great length, and altogether this crosshead is a great improvement over those first used on this type of compound, and it will reduce to a minimum the objections that were made to the earlier designs.

The pistons are of wrought iron, drop forged, well ribbed and so light as to please the eye at once. They are made in two parts, with packing and junk rings as usual. They are not single-plate pistons, as might be supposed, but are made with two plates, both ribbed from the hubs to the flange, which forms the receptacle for the packing rings. The reduction of weight resulting from the use of these crossheads and pistons is fully 50 per cent., and it is a necessary improvement that the *Railroad Gazette* has called attention on several times

during the past two years. This 50 per cent. reduction of weight of reciprocating parts means 50 per cent. less excess of counterbalance in the drivers and is of more practical value in reducing damage to track and bridges than any amount of fancy engine designs with cranks at 180° with which we have been flooded of late.

On a preliminary run, in fact its first run, this engine took 27 loaded cars from the Baldwin shop to Belmont, on the Reading road. This is an up grade about five miles long and is a good pull for a new engine. All parts worked well and there was no sign of heating. The exhaust, even in the heaviest part of the pull, was scarcely audible.

Schuttler Double-Acting Track Drill.

The track drill shown by the illustrations, figs 1 to 6, has some marked advantages over most drills used for this purpose. It occupies but little space lengthwise and has a double action—that is, it cuts on both the forward and return stroke. Fig. 1 shows this drill in position for drilling a rail, and also the clamps that are sent out with it. Fig. 2 shows more clearly than the other illustrations how the drill operates. From this it can be seen that there is a drill spindle, fig. 3, which holds the drill in one end (at *A*) and passes through two bevel gears, one of which is shown at *B*, fig. 4, and also through the gear shaft *C*, fig. 5. The end of this spindle is flush with the end of the gear

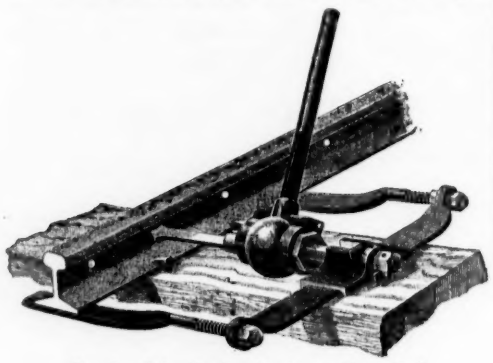


Fig. 1.—Schuttler Double-Acting Track Drill.

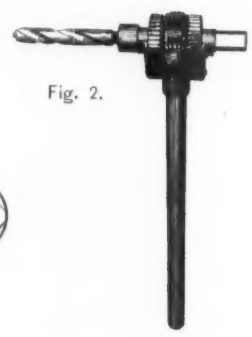


Fig. 2.

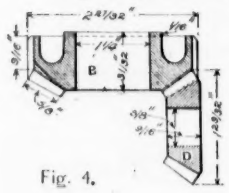


Fig. 4.

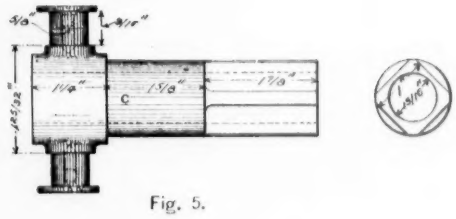


Fig. 5.

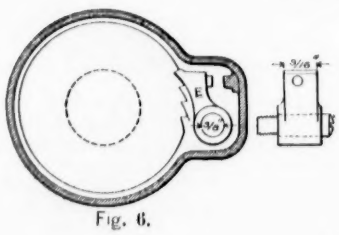


Fig. 6.

Fig. 3.

SCHUTTLER DOUBLE TRACK DRILL.

shaft as shown. The gear shaft fig. 5 carries two lateral trunnions on which revolve two bevel pinions, *D*, fig. 4. There are two pawls, one of which is shown at *E*, fig. 6, that catch in the teeth on the periphery of the bevel gears *B*. When the handle is moved in one direction one pawl engages in the bevel gear next to the drill spindle at *F*. When the handle is revolved in the opposite direction the other pawl catches in the teeth of the bevel gear farthest from the drill and the drill is revolved in the same direction as before by the bevel pinion. All parts of the gearing and spindle are made of the best machinery steel, hardened, and ground to a good fit. This drill received much attention at the recent Cape May conventions. It is sold by the Schuttler Mfg. Co., Chicago, Ill.

Railroad Matters in Peru.

An engineer engaged on the Central Railroad of Peru writes to us under date of May 6, giving information of various matters of railroad interest.

Concerning the Inter-Continental railroad surveys he says it is not probable that the amount appropriated will permit more than reconnaissances to be made by the parties in the field. He suggests that there may be some trouble from the Indians living east of the Andes, in the heavily timbered country along the headwaters of the Amazon and its branches. The local belief is that the Indians are cannibals, and that they kill their enemies by the use of poisoned arrows blown from blow-guns. He has seen a head that had been treated by these Indians in a manner similar to that employed by the Indians of Alaska. All the bones of the skull were removed, and the skin and muscles were shrunk into a mass about 4 in. in diameter, but the features roughly preserved. Our correspondent thinks that this will illustrate one of the possible incidents in the life of a Pan-American engineer.

Work on the construction of the Central of Peru is proceeding slowly; 50 miles are building. At the date of the letter work was a good deal delayed for want of lumber for timbering tunnels, and also for lack of cement and powder. The Rimac River makes a good deal of trouble every year about the end of the rainy season. No provision was made for this contingency. March 9 the river rose, and two months afterward no train had got through to the end of the line.

One feature of the country is avalanches of mud carrying down large stones. These sweep everything before them, and it was such an avalanche that carried away the Verrugas Bridge. One of these dammed the Rimac River this year, making considerable trouble.

Most of the laborers are Indians, and at the date of the letter they were off digging potatoes. If all planted at the same time work would have to be stopped, but fortunately there is sufficient difference in the time of ripening of the crop to enable contractors to keep some laborers at work.

It was expected that orders would be received to build a branch to Ceno de Pasco, 80 miles.

In the south Mr. Norris is building about 42 miles of the Juliaca & Cuzco, from Santa Rosa to Sicuani. This is all light work.

Surveys are being made for an extension of the Trujillo road and others to change the location of the Chimbote. This was located and partly built in the Santa Valley and through a cañon in the Black Range. It was washed out badly, and now an effort is being made to cross the range. The lowest pass is 16,000 ft. Then there would be a descent of 8,000 ft., with four per cent. grades on both sides of the tunnel, and very heavy work. Going up the Santa would be a continuous grade with a maximum of two per cent. If the road is built on this line it would be one of the best in Peru, as the valley is large and well peopled. It is fertile and will produce sugar cane in the lower altitudes and wheat higher up. It also has considerable mineral deposits, with good coal.

The Moran Flexible Steam Joint.

The illustrations, figs. 1 to 3, accompanying this, show an all-metal connection used on the Chesapeake & Ohio steam-heated trains between the locomotive and tender. The mechanical department writes us that this joint has been in use for the past eight months without a single failure by leakage and only one failure by breakage—that of the horizontal pipe where the thread was cut too deeply on one side.

This joint is made without packing, and is perfectly tight with the metal-to-metal connection. Good workmanship makes this joint tight at the start and it keeps tight in service because the wear is uniform. The construction is as follows: On the end of a pipe connected to a valve leading from the boiler is screwed the hollow cast-iron sphere *A*, fig. 1, which is ground true on the outside to make a tight joint in the screwed ring *B*, fig. 2, which is ground true on the inside. The lower half of the joint is also of cast iron and is turned out to receive the hollow sphere, but is not intended to make a joint thereon.

The ring makes a tight joint at *C*, fig. 2, and when this ring is screwed down tight the sphere is so loose in the cavity thus provided that condensation in the pipe can run out; but as soon as the pressure is put on the sphere is forced to its seat and a tight joint is made. This automatic draining feature was shown to many visitors at the recent railroad conventions, and has been found to be of particular value in the connections made to rock drills, and in sawmills, in cold weather. The drainage takes place at once in a horizontal pipe after the pressure is removed. The joints are made with straight through openings or with angle openings as shown by figs 2, 3 and 4.

The success of this joint for the connections in a large number of the Standard Oil Co.'s refineries led the owners to introduce it into rock drilling and portable steam engine work generally, and the continued success in these fields gave confidence to apply it to the connection for steam heating of railroad trains. In this field it was a success on one of the Florida specials last winter, and on several roads where it was applied for trial. These joints are kept in stock in sizes ranging from ½ in. to 6 in., and special sizes as large as 10 in. have been made for large flexible connections. The Moran Flexible Steam Joint Co. has offices at Louisville, Ky.

Track Stores.

Those who have studied the effect of organization on the forces of the Maintenance of Way Department will admit the utility of systematic methods in supplying materials and tools for the use of these forces. A few railroads have already made progress in this direction each acting independently on the lines suggested by its own experience, and in this way much has been done to develop the economy and efficiency of the supply department. But on most of the smaller roads the absence of any definite plan of procedure is still responsible for needless waste, confusion and delay.

It is not uncommon to find a division of road encumbered by a quantity of material so old fashioned as to be useless for repairs. New patterns are constantly introduced as improvements on the older forms, and even in spite of the greatest vigilance a large amount of the parts replaced will accumulate along the line. When, for instance, new rails are laid on the main line the old rails taken up are sent with their fastenings to the branches or are used in side tracks; but there are sure to be left over a few old splices here and a frog or two there, so that by degrees each toolhouse is surrounded by the familiar assortment of material which is rarely available even in an emergency. The same is true of tools to such an extent that a premium might well be offered to the foreman who could show the smallest number of useless tools in his carhouse.

There is no doubt that a division looks badly in this condition, nor that it is wasteful; but it is open to a still greater objection. Most orders for material, to be used in repairs originate with the section foreman. If his section is dirty (dirt being considered as matter out of place) he will be careless as to the amount of material ordered. A few extra switch-rods or splices are handy things to have laid by. This undesirable stock is often increased by the receipt of unsuitable materials due to the fact that few formen can describe the required materials accurately. Moreover, there are many articles sent to the shops for repairs which eventually return to the division, and must be held there till needed.

The Foreman's order for material or tools is sent to the Supervisor, who should be so familiar with the needs of each section as to be able to pass upon the order intelligently, and to forward with approval to the Roadmaster (Division Engineer) only such part of it as is required to maintain the standard agreed upon for the section in question. But, as a rule, the Supervisor will rely upon the Foreman to ask for enough material, and will give himself little uneasiness on account of any surplus. Occasionally a Superintendent or Roadmaster will become convinced that sufficient care is not being exercised in checking the foremen's orders, and will either cut down the requisitions at a venture or refuse to pass them altogether till satisfactorily explained. Of these two methods the latter is preferable, since it involves merely the delay incident to an investigation, and, if persisted in will lead to reform, while the former occasions great confusion, and is productive of no permanent good. The wisest course will be for the proper officer, presumably the Roadmaster, to make careful inquiry into the causes of the trouble, and to eradicate them by substituting for the lax methods in vogue a complete and simple plan in which all persons shall be made to co-operate.

First, as regards tools and materials, the needs of each section should be fully canvassed and a list for each compiled with reference to the standard of excellence which it is determined to maintain on that section. This will vary for the different parts of most roads, but the lists should be as nearly uniform and as small as possible, and it should be the aim of the Roadmaster to reduce them as experience proves it expedient to do so. Then let each Foreman receive a list of the tools and materials for repairs, which he will be required to carry, and draw for the purpose what he can from the supply already on his section, and send to headquarters promptly a statement of what he lacks to complete his quota.

At the headquarters of each Supervisor should also be carried, and under his charge, material of the larger classes, such as a duplicate of each pattern of frog and switch in common use. These should be neatly arranged on skids or platforms, so placed that they may be readily loaded on passenger trains, when required at distant points, on short notice. This stock should be as small as possible, and is intended to meet the needs of the service in cases of emergency only. When any article has been sent from this store it should be replaced

at once, so that the supply shall be invariable and complete.

Now, let all tools and materials of any description whatever, except such as are named on his list, or are otherwise distinctly specified for retention, be neatly loaded by each Foreman, and sent to some designated point where there is room to assort them. Such of it as is fit for use will probably be required to complete the standard supplies already mentioned for the various sections, and any deficiencies remaining should be promptly covered by appropriate requisitions.

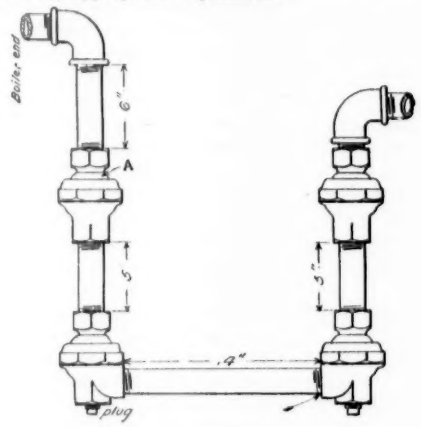


Fig. 1.

The order to ship material from the sections should of course include all kinds of scrap. Few roads are now without "scrap laws," which should require each section of road to be cleared of scrap once every week, the accumulation being stored at the carhouse and loaded on the scrap car of the local freight on a stated day in each month. These laws should be rigidly enforced, and nothing will accomplish this unless it be eternal vigilance on the part of the authorities. The Roadmaster will not find this task of cleaning the division an easy one if he does it thoroughly; and unless it is done thoroughly it will be of but little use. Most supervisors will oppose the movement, and the foremen will not part with their so-called supplies without a murmur.

But when the work is finished and all surplus material shipped to a general store there will be left on the division only such supplies and tools as are covered by the lists for each section, which, as stated, are merely the articles for daily use, such as spikes, bolts, nut locks and so on, and the ordinary outfit of tools, together with the stock in charge of each supervisor and any quantities of ties, switch-ties, rails, etc., which are too heavy to be moved about and the amount and location of which are on record at headquarters.

Although we are chiefly concerned with the affairs of a single division of road it will assist the view to consider briefly the general system of accounts. At some point on the road there is a general store where is maintained at all times, in charge of a storekeeper, a stock of all such materials and tools as are in constant demand. The storekeeper keeps a set of books in which he is charged with the value of the stock on hand and supplies received, and credited with the value of all supplies issued to the divisions. Each division also keeps a similar set of books for its roadway and bridge material account, in which the division is charged with the value of all stock on hand and supplies received, and credited with the value of supplies shipped away, whether for repairs or as scrap, or otherwise. The division account is also credited with materials used, but when old materials are sold or sent away the account must be charged as well as credited with their value.

On a stated day in each month the Section Foreman will send to his Supervisor, on a prepared blank form, a report of all tools and materials on hand. This report must correspond with the list of supplies which he is required to carry, less the amount used during the month, which must also be stated. On a separate blank will be stated the supplies needed to complete his stock and any extra supplies which he deems necessary for use during the ensuing month. The Supervisor will examine carefully the reports of materials used, and require any unusual quantities or discrepancies to be explained. He will also keep himself informed of the needs of each section, so as to judge intelligently the requests for extra supplies. Having gone carefully through the requisitions, canceling such as he believes unnecessary, he will send to the Roadmaster a statement of what is required on each section, and will return the originals with his notations to the foreman, so that all may know what they are to receive. The Supervisor will do well to retain an impression copy of his statement to the Roadmaster, in order that he may have a complete record. The Roadmaster, on receipt of the Supervisor's statement, will make formal requisitions for the materials, but he will always advise the Supervisor of any alterations he may make, so that the Foreman concerned may be notified. This rule should apply in every office through which the requisition may pass on its way to the Purchasing Agent. All supplies ordered in the manner outlined should be sent from the general store, or the manufacturer, direct to the point of use, and the Foreman should report each month all articles ordered, and not cancelled, in the previous month and not yet received. Every article received on the division should be covered by a bill from the general store showing the quantity, quality and price. This bill should be recorded by the Roadmaster and sent to the Foreman for acknowledgment (if the consignment is correct as to quantity and quality), and then returned to the Roadmaster, who will approve it and make appropriate entries in his accounts The plan of sending supplies to the Foreman direct instead of having them distributed by the Supervisor has several advantages. It stimulates the interest of the Foreman in the quality of the materials and insures a more minute and particular inspection. It relieves the Supervisor of much unnecessary work, and does not debar him from inspecting the materials, since he would surely do so in his ordinary round of duty if sufficiently attentive to the interests of the company.

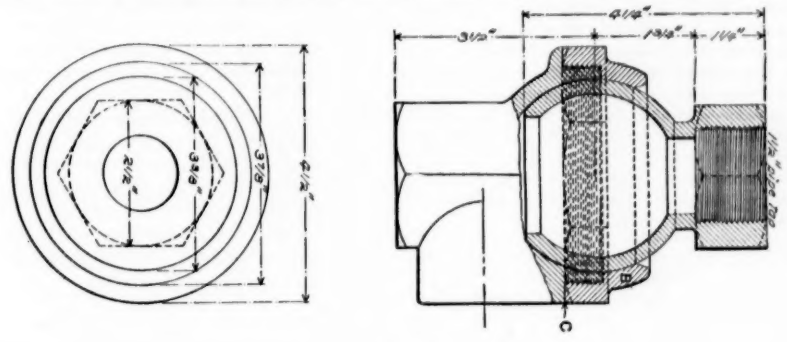


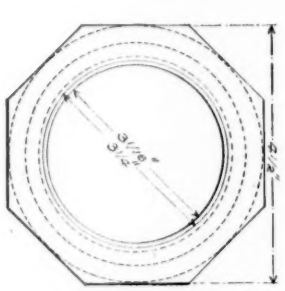
Fig. 2.

Orders for materials for new work will usually originate in the Roadmaster's office, and can be filled in any convenient manner which will not conflict with the general plan; but care should be taken to rid the division of any material remaining after completion of the work in question, lest there be a return to the old order of things.

When supplies are required in haste, as by reason of a broken switch or frog, the Foreman will notify the Supervisor and Roadmaster simultaneously by telegraph. If the Supervisor can fill the order from his store he will do so, using his discretion as to shipping by passenger or freight train, and will advise the Roadmaster and Foreman of his action. If he has not the required material he will so inform the Roadmaster, who will request the proper officer (presumably the General Superintendent) to have it sent from the general store. In this connection it will be of great advantage if the dispatcher is permitted, on request, to direct the forwarding of specified cars of "company's freight" without bills.

With regard to the treatment of materials for repairs the great danger is, as already pointed out, that when an article has been so worn as to require repairs it will be replaced by a new one and sent to the shop, from which it will return, when repaired, to its original place, where it is no longer required. This practise is productive of two evils—first, without a system of accounts, so complicated as to be impracticable, the exact expense of maintaing each section of road cannot be recorded; second, the accumulation of materials in the wrong place will defeat the objects of the foregoing plan. The proper way to meet this question is by a general repair shop situated if possible near the general store. All worn-out tools and materials, unless obviously past repairing, should be sent to this general shop where, a competent man should inspect each article and decide whether it would be economical to repair it or not. If repaired, credit will be given to the division from which it came for its full value less the cost of repairs, and if scrapped credit will be given as such.

For the sake of simplicity the track department only has been considered in these remarks, but it will be understood that the same system will apply with as good results to carpenter, bridge or signal departments. The objects of the plan outlined are to reduce the amount of material carried in stock, to reduce the cost of repairs and to provide for the prompt delivery of material without waste. The object of this paper is to show how this may be done, and to say that it has been done in at least one instance by means of the system of organization described.



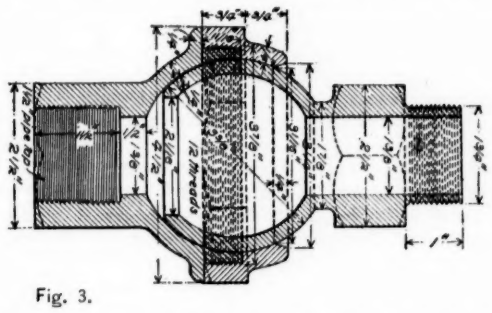
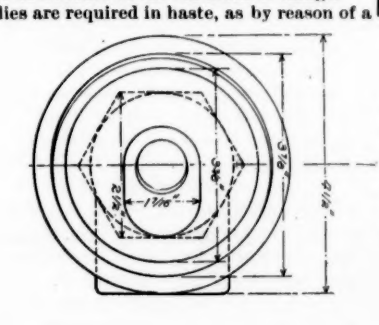


Fig. 3.



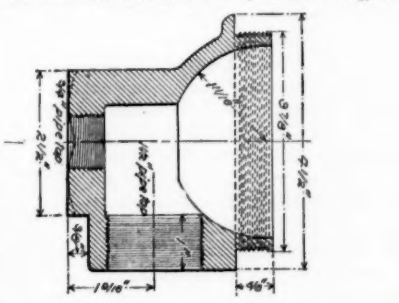


Fig. 4.

THE MORAN FLEXIBLE STEAM JOINT.

The Bursting of a Six-inch Gun.

A very serious accident to a built-up gun occurred on June 20, on H. M. S. "Cordelia," near the Fiji Islands. In the course of gun practice, a 6-in. gun, charged with a common shell, burst. As described in the London *Times:* "On firing nearly all those who stood round the gun were killed. Huge pieces of iron flew in all directions. The lift of the fore royal yard was cut. The breech-block and a large portion of the gun carriage were hurled across the deck; the upper deck was burst through, and part of the gun-carriage was blown into the main deck. Fragments of the shattered gun fell into the sea hundreds of yards away to the starboard." It was a port gun that was fired.

Heretofore the failures of built-up guns have mostly been through blowing off the muzzle end of the guns. This accident is much more serious, and justifies the declaration by the *Engineer* that "Terrible as the accident is in itself, we fear that its full significance will hardly be appreciated at first, for England has some 530 6-in. guns afloat." These are inferior in power to the 6-in. guns built by our naval authorities, and even they are not able (as shown at the Annapolis trial of last September) to destroy English armor 10½ in. thick, nor to inflict any material damage on Schneider plates of the same thickness. If to this general ineffectiveness the element of destructiveness to the crew is to be added, it would seem better to go back to the Rodman gun, none of which, we believe, has ever burst in service.

Engineering refers to the fact that "no less a person than Dr. Anderson, the Director of Ordnance Factories," called attention to the possible danger of fissures or cracks arising from oil-hardening, but when it said the gun had been reported as defective it was probably nearer the true cause of the accident. It has long been rumored that there were grave defects in the construction of the British guns as well as in other work passed by naval and other authorities, and this is said to be so far recognized that the larger guns at first are not subjected to as thorough a test as is desirable, or as guns receive at the proving grounds of this country.

This accident is also pertinent to the contentions of those in both countries who have argued that we should trust to 6-in. guns, as there was less danger of imperfect workmanship with the smaller pieces requisite for their construction; but the explosions of larger guns have been less dangerous to life than this explosion on the Cordelia, and the wreck of a 6-in. gun seems more complete than that of heavier guns.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The switch and signal system that the Pennsylvania is building in connection with its new high-level passenger station at Jersey City, and which is described on another page of this issue, is worthy of special attention, as it is one in which details have been worked out more thoroughly than in perhaps any other plant of the kind thus far established. The officers in immediate charge are among the most accomplished in their profession, and the men above them, who hold the purse strings, have intelligently co-operated in their efforts to produce a perfect arrangement. The provisions against accidents and emergencies are perhaps the most noteworthy features. The use of electricity and air pressure, both of which can be conveyed under ground, leaves the surface comparatively free from obstacles for men to stumble over. The electric switch valves promise to satisfactorily take the place of air pressure for that part of the work and thus do away with one considerable source of annoyance and expense, to wit, the liquid medium used in the switch-valve pipes to obviate the slowness of motion due to elasticity of the compressed air. The main tower has no need of fires or of gas or oil lights, nor even of matches, as smoking is not allowed; so that danger of fire is quite remote. The arrangement of distant signals for inward trains permits high speed up to the very end of the track, barring only space enough to surely make a stop before striking the buffers. Every signal post is fixed just where it ought to be fixed, no compromise with principle having been tolerated for the sake of saving a few dollars. Even if these signal bridges were still more costly, it is no more than right that the New York terminal of such an important passenger line should afford the best possible example of correct signaling. It will be interesting to note what sort of an excuse an engineman will present if he fails to obey one of these signals. The rubber blades on the dwarf signals are a perfect success. The new train shed is now in use and the interlocking at tower A has been in service several weeks, but the new headhouse is yet to be built and parts of both the iron and the earth work for the tracks between "A" and "R U" are still unfinished.

The great inconvenience which the community suffers by the unreasonable delays imposed upon heavily loaded passenger trains at drawbridges is once more brought to notice by the action of the New York Central & Hudson River Railroad last week, in petitioning the New York City Board of Park Commissioners to forbid the opening of the draws in certain city bridges during the morning and evening hours when suburban travel is heaviest. The road has taken a backhanded way of attacking the problem, but, in view of the great difficulties connected with it, any fair means will be generally regarded as not only proper but urgently needed. The railroad bridge over the Harlem River at Fourth avenue is situated between the city bridges crossing at Third avenue and Madison avenue, and the officers of the road reason that if the street draws are kept closed by authority the railroad draw can remain closed during the same hours without authority—which is true, as the three bridges are close together. But it is difficult to see how anything can be accomplished by this appeal to the city. The ultimate authority over navigation on the river undoubtedly rests with Congress, and there is no reason to hope that any more favor will be shown to wagons and pedestrians than to railroad trains. Attempts to procure state legislation for the mitigation of this abuse have failed because of the universal feeling that only Congress could take any effective remedial action. But the thousands of people who cross the street bridges have the same interest as the other thousands who ride in the cars in curtailing the extensive privileges under which mud scows are now so much superior to fast express trains, and it is well that the subject is brought to public notice. Agitation is the only visible means of accomplishing any improvement, and the railroad company is the proper party to start it. A tunnel or a high bridge must be the final remedy here if the Grand Central station is ever to be used to its fullest possible capacity; but there are so many difficulties in the way of both of these plans that it will not be strange if several years elapse before anything is done toward carrying out either of them.

A rear collision happened on the Paris, Lyons & Mediterranean Railroad at St. Mande, near Vincennes, last Sunday night, which was terrible in its consequences. The latest dispatches say that 50 persons were killed outright or have since died, and about 100 were wounded. The trains involved were excursion trains. Three cars were telescoped and then took fire. It is said that persons who were not already killed or burned to death were drowned by the water used to extinguish the fire. Forty minutes elapsed before the firemen got to work. The causes of the accident are not yet determined. It is said that the first train was delayed beyond its time; that the signal which should have protected it showed clear; that the Westinghouse brake on the second train had been cut out by some one who sought "revenge" and that the signal *was* at danger. It is useless to speculate as to the causes of the accident until more is known. One dispatch said that the fire was set by the explosion of the cylinder holding gas for lighting the cars. As the Paris, Lyons & Mediterranean has over 1,400 cars lighted by the Pintsch system, and as we have never heard of an authenticated case of a fire having been set by this gas, we at once started inquiries as to the truth of the story. A cable dispatch from Count Delmarre, the Managing Director of the Pintsch company in Paris, says: "No gas explosion. Fire set by ash-box of engine." This is not exactly disinterested testimony, but we shall accept it without any question until we have good testimony to the contrary, for it is in keeping with the probabilities. It is very questionable if a gas tank would explode under such circumstances. The piping connected with the apparatus would naturally be broken and the gas under high pressure be immediately released. In this country, where compressed gas has been in use many years on some of the most prominent roads, we have never known of such an explosion. Many and repeated wrecks have taken place, and the cylinders have been wrenched from their fastenings or the connections broken, and no serious results from fire have followed. Gas might take fire in wrecks of this nature, but, being under compression, its escape would be almost instantaneous and the resulting blaze of short duration. There are in fact cases on record where a fire starting from some other cause has been extinguished by the force of the issuing gas.

A Washington correspondent, referring to our note of last week about putting signals to danger as soon as practicable after they have been accepted and used by the engineman, writes as follows:

> Some years ago I stood upon the platform of a station of one of the Pennsylvania's roads near Baltimore, at which there is a block-signal tower. A heavy freight approached and, the white signal being shown, proceeded on its way. About midway of the train was a car the rear truck of which was derailed, and the wheels were running upon the ties. When this car passed the signal tower the operator saw it, and at once changed the signal to red. This change was almost immediately followed by the stoppage of the train. Was not this incident *one* good reason at least for the practice of keeping the signal clear until the *whole* train has passed? Again, will you kindly explain how a train could cover a whole "block," in time to get into a second one, before a preceding one had passed its own length and 300 ft. more into the second one?
>
> The express at Ravenna on July 3 was standing still. Why should the signal have been white, as it was? Was it not the joint fault of the signal and the rear brakeman, neither of whom seem to have been in a hurry to take ordinary precautions, to say nothing about obeying running rules, rather than of the engineer of the freight?

The desirability of having a conspicuous signal at hand for use in case of accident has been brought up before as an advantage of keeping signals at clear a long time. A hand flag or lantern would in most cases be equally efficient; but supposing it were not, is it right to treat this contingency of a derailment as an important consideration in arranging signal rules? The reasons for *not* keeping a block signal at clear except when admitting a train seem to us of far more consequence. Such a signal should be put to danger at once, simply to make the practice consistent with that in large yards, if there is nothing more important than consistency to prevent; but beyond this, the rule is important, even regarding the functions of a block signal alone. Block sections are often quite short, so that the supposition of our correspondent that it is impossible for a train to traverse one in a short time is fallacious. English enginemen have many times looked over the tops of cabooses and of buildings and observed signals pulled off for preceding trains, and have smashed their engines in consequence. More practical than either of these points, perhaps, is the fact that most roads practice permissive blocking, so that the liability of one train catching up with another in the same block exists not only on short sections and at rare intervals, but in every-day service. Our correspondent's last point is rather vague. The operator ought certainly to have done everything in his power to stop the freight, but there is no evidence that he saw or heard it approaching. The brakeman probably had no authority over the train-order signal. The fault was in the system. The true place for a train-order signal at a passenger station is in advance of the point where engines usually stop. This involves the use of two signals, one for each direction, and at once emphasizes the need of two more, to stop trains before they reach the station; and it also necessitates the employment of wire connections alongside the track, which must be taken care of, or of electric signals, which cost more; but probably no one defends the use of one signal for all these purposes except on the grounds that it is cheaper.

Six-Coupled Locomotives for Express Trains.

The report of the Master Mechanics' Association Committee on Locomotives for Heavy and Fast Service must read queerly to European engineers, who observe in American technical papers mention of the successes of ten-wheelers and moguls in hauling heavy fast passenger trains on more than twenty of our most prominent roads. On most of the lines from New York to Chicago, and more particularly on the "limited" trains, such locomotives are used daily, and this fact is so well known as to excite no comment either here or abroad; yet the Committee said, regarding the value of six-coupled engines for passenger service: "While ten-wheel and mogul engines have been in use for years, yet they have not been used for fast freight and passenger service long enough to afford a great deal of information from actual experience, and many of the answers are given on general principles." Evidently the Committee did not get "a great deal of information" on this subject—at least, it did not show in the report—but that does not indicate, as one might be led to believe, that we have but little experience with six-coupled express engines. It does show, however, that the Committee did not go about the investigation in the right way to gain the desired information. Railroad mechanical officers are too busy to write opinions in answer to printed circulars of inquiry, when they know that if they give valuable information it is more than probable that their letters will be used verbatim. They have not the time to write essays and arguments in a style which they would be willing to submit for publication; but yet they are willing almost invariably to give to the Association committees, in a personal interview all the available information they possess. In this case the circulars were briefly or guardedly answered, if answered at all, and the vast amount of available data on this subject was not collected.

Ten-wheel and mogul locomotives are both six-coupled and are now the favorite for fast express trains; and their success is indisputable. Such roads as the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St. Paul, the Erie, the Baltimore & Ohio, the Michigan Central, the Wabash, the Chicago & Northwestern and several other prominent lines use these types almost exclusively for their heaviest and fastest passenger trains. On such roads as these no question exists as to their adaptability for high speeds. The Mogul and 10-wheel designs are practically the same engine, excepting in the one detail of front truck, and they may fairly be called the standard type of heavy American express locomotive of to-day.

In discussing the relative merits of these two representatives of what is practically one type, one is

necessarily confined to a discussion of the two-wheel and four-wheel truck as a guiding mechanism for the front end of a locomotive, the wheel bases, the boilers, grates and running gear being practically the same for both. There is of course a chance for considerable theoretical discussion of the difference in the action of a two-wheel and a four-wheel guiding truck, but practically there seems to be no difference between the two, except that it is generally the case that the ten-wheeler has a slightly greater total weight than the mogul for the same weight on drivers, which results simply from the use of the four-wheel truck. It cannot be shown that either of these trucks is more or less conducive to accidents resulting from derailment or breakage, although the advocates of the ten-wheeler claim it to be the safer engine.

The main reason for preferring six-coupled locomotives over the old "American" type for passenger service is, of course, the same as in the freight service, to wit, that loads are constantly increasing, and that there is a limit to the weight that can safely be put on a single pair of wheels. More wheels must therefore be used to get economical service. But it is well also to keep in mind the incidental advantages that have been found to result. Higher speeds as well as heavier loads are imposed by the passenger service, and here the effect of counterbalance weights at once comes in as a factor. In the six-driver engine there is less weight on each individual wheel, and of the weight used for counterbalance in each wheel there is less unbalanced even when the total weight on drivers is considerly increased; hence the engine is less destructive to the track and bridges, and at the same time more powerful for the same total weight. The useful weight of the six-coupled engine—that on the drivers—is a larger proportion of the total weight than is the case with the four-coupled eight-wheelers, as there is less weight on the front truck. Again there is generally a better chance to use a satisfactory size of boiler, as the increased weight can be largely put into that part of the engine.

In the stress of sharp competition many managers demand that some of the heaviest trains do what is virtually a through and a way business. They must run at high speed so as to make short time between termini, and at the same time must make frequent intermediate stops to obviate the expense of an additional train. We have therefore in this and in other kinds of service a demand for great starting power, combined with a design that will run economically at high speeds. Most of the obstacles to a symmetrical development of the locomotive are of a more or less relative nature, and the designer should work well up to the limitations imposed by them. If he does not he will come to a stopping place while his more progressive neighbors are still making improvement. Any minor difficulties, such as additional complication of details or cost of repairs, are quickly swallowed up by the advantages in securing increased business that a powerful engine affords, and wide-awake general managers will brush them aside as quickly as they did the claim made by the brakemen a few years ago, that long freight trains should not be run.

The report of the Master Mechanics' Association Committee might well have stated, and without fear of contradiction, that the six-coupled American express locomotive is an undoubted success, and that after a wide experience with it under all the varied conditions of American service it is now the favorite type on nearly all of the largest roads.

The Australian Brake Trials.

The account of the trials of the Westinghouse automatic brake, made by a board appointed by the South Australian Government, cannot fail to be of interest to railroad men here when compared with the results obtained on the 50-car Westinghouse train which traveled about this country in 1887. The Australian trains were mixed—that is, a large percentage of the cars were loaded. Therefore the braking pressure was less in proportion to the load than if they had been empty. The braking power averaged at different times 58, 59 and 65 per cent. of the total weight of the train. The 50-car American train was empty, and consequently the braking power was much higher in proportion to the total weight. The brakeshoes of the American train were close to the wheels, and the brakes should have been better applied under otherwise equal conditions than on the Australian train, where they were 1 in. away from the wheels. Yet, it might be said to the contrary that the Australian trains were shorter than the American trains in proportion of 570 and 900 ft. to 1,900 ft., and the brakes on it should for that reason have applied quicker, and therefore should have been slightly more effective. The following table shows the comparative length of stops made at speeds from 35 to 38 miles per hour in this country and in Australia:

Train.	Length of train—feet.	Weight of train and locomotive—tons.	Number of loaded cars	Number of empty cars.	Down grade in feet per mile.	Speed in miles per hour.	Length of stop—feet.	Time occupied in stopping—seconds.
American...	1,900	825	0	50	Level.	36	490	14
"	"	"	"	"	"	37	583	....
"	"	"	"	"	"	37	488	15
"	"	"	"	"	"	34	470	15½
"	"	"	"	"	53	36	507	18
"	"	"	"	"	"	35	502	17
"	"	"	"	"	50	35	542½	17½
"	"	"	"	"	40	38	573	19½
"	"	"	"	"	35	36	560	18¾
"	"	"	"	"	32	39	648½	19½
"	"	"	"	"	40	36	593	19½
"	"	"	"	"	"	36	579	18½
Australian..	903	464	39	11	86	35	559	18
"	"	"	"	"	86	35.5	580	18½
"	570	302	23	7	86	38.5	643	21
"	"	"	"	"	66	34.8	570	19½
"	"	"	"	"	Level.	33½	377	13

The tests made to show the distance apart of the sections of a train when stopped after breaking in two parts, with the American and with the Australian trains, show a wide variation, which is due, of course, to the variety of conditions. The American train was uniformly unloaded, and therefore the distances apart of the sections are more nearly alike than those in the case of the mixed Australian trains. The distances in feet between the sections at various speeds are as follows:

Australian.....12 ft. 10 in.—8 ft. 7 in.—touch—37 ft.—18 ft. 16 in.
American.....35 ft.—43 ft.—59 ft. 57 ft.—21 ft.—61 ft.—50 ft.

The Australian results show that in mixed trains if a break-in-two occurs ahead of the loaded portion, and therefore behind the light portion, the sections will be closer together at the stop than if these conditions were reversed. The lack of data regarding the exact point at which the Australian train was broken at the time when the two sections came together prevents any explanations of the reasons of the contact.

It is stated in this case that full steam was kept on the engine until the train came to a dead stop, and, with the brakes in good condition, there can be hardly any other reasons for the rear of the train running into the front than that the majority of the loaded cars was back of the breaking point.

The Australian tests, we may safely assume, have been made by a critical and unbiased board, and the fact that the entire board approves of the mechanism, and that the objections offered by two members to its general introduction are based on matters of policy, and, furthermore, that the vacuum-brake companies did not see enough possibility of a successful competition to make it worth while for them to enter, are all in striking contrast with the results of the alleged trials in India. All that the Board says in the report about the wear and tear and graduating power and leakage is favorable. What is said about the efficiency of the brake when the shoes are worn hardly applies here, as it may be that the cylinders under the Australian cars are larger in proportion to the pressure on the wheel than is found here with our heavy cars. Here the shoes must be kept adjusted, or the pistons will bottom in the cylinder and the efficiency of the brake be destroyed.

The report says, regarding the rapidity of the brake in switching: "With expert shunters the time taken to shunt trucks fitted with the brake would be practically equal to that taken with wagons fitted with the ordinary hand brake." This is one of the most important points connected with the operation of air-braked freight trains. With long trains much time is sometimes lost when setting out a car if there is a leak in the train. It happens in this way: The part of the train not engaged in the switching is left standing with the brakes on or only partially on while the engine is shifting the car. On the return of the engine the brakes will, under this condition, have leaked on full, and have to be pumped off before a start can be made. This is one of the best reasons for keeping the air brake in perfect repair, and emphasizes the advantage of a class of inspection at points of interchange such as to compel each road to keep up the brake gear on all cars passing over it, and prevent the delivery of cars which are in such condition as to cause vexatious delays in transferring freight from way trains. Brake failures and leakages are already too often the excuse offered for a way freight crew to loaf at an agreeable station for an hour or two at night.

The fact is, there are but few, if any, failures of the compressed air brake in this country in cases where the brake has received a reasonable amount of attention from a good inspector, and has been operated by a fairly competent engineer, and the favorable conclusions of the Australian report are justified by experience here as much as they are by the past experience in Australia, by the recent tests, and by the experience had in England.

June Accidents.

Our record of train accidents in June, given in this number, includes 50 collisions, 109 derailments and 8 other accidents, a total of 167 accidents, in which 60 persons were killed and 237 injured. The detailed list printed on another page, contains accounts of only the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:			
Rear			22
Butting			18
Crossing and miscellaneous			10
			— 50
DERAILMENTS:			
Loose or spread rail	6	Bad loading	1
Failure of bridge	4	Track repairers	4
Defective switch	6	Animals on track	5
Defective frog	3	Landslide	2
Broken wheel	2	Washout	5
Broken axle	7	Flood	2
Broken truck	3	Malicious obstruction	2
Fallen brakebeam	2	Accidental obstruction	3
Broken drawbar	2	Purposely misplaced switch	1
Failure of power brake	1	Unexplained	41
Misplaced switch	5		— 109
Runaway train	1		
Careless running	1		
OTHER ACCIDENTS:			
Boiler explosion			1
Broken parallel rod			2
Various breakages of rolling stock			1
Cars burned while running			2
Other causes			2
			— 8
Total number of accidents			167

The causes of collisions, where given, were as follows:

	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	5	..	..	5
Misplaced switch	..	2	..	2
Failure to give or observe signal	1	5	..	6
Mistake in giving or understanding orders	..	3	..	3
Miscellaneous	7	2	1	10
Unexplained	9	6	9	24
Total	22	18	10	50

A general classification shows:

	Collisions.	Derailments.	Other Accdts.	Total.	P.c.
Defects of road	..	19	..	19	11
Defects of equipment	5	17	5	27	16
Negligence in operating	21	12	2	35	22
Unforeseen obstructions	..	20	1	21	12
Unexplained	24	41	..	65	39
Total	50	109	8	167	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other Accdts.	Total.
Passenger	20	33	5	58
Freight and other	74	76	3	153
Total	94	109	8	212

The casualties may be divided as follows:

KILLED.	Collisions.	Derailments.	Other Accidents.	Total.
Employés	19	27	4	50
Passengers	1	4	..	5
Others	4	1	..	5
Total	24	32	4	60
INJURED.				
Employés	50	78	2	130
Passengers	19	88	..	107
Others	..	..	..	..
Total	69	166	2	237

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	..	11	8	6
Defects of equipment	..	..	7	8
Negligence in operating	1	19	20	59
Unforeseen obstructions and maliciousness	2	22	5	34
Unexplained	2	55	10	23
Total	5	107	50	130

Thirty-four accidents caused the death of one or more persons each, and 37 caused injury but not death, leaving 96 (57 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with June of the previous four years shows:

	1891.	1890.	1889.	1888.	1887.
Collisions	50	64	33	64	43
Derailments	109	67	42	76	42
Other accidents	8	6	4	3	3
Total "	167	137	79	143	88
Employés killed	50	41	18	30	13
Others "	10	17	17	10	3
Employés injured	130	98	49	67	37
Others "	107	155	53	58	63
Passenger trains involved	58	65	36	51	32
Average per day:					
Accidents	5.57	4.57	2.63	4.76	2.93
Killed	2.00	1.93	1.17	1.33	0.53
Injured	7.90	8.43	3.40	4.17	3.33
Average per accident:					
Killed	0.359	0.423	0.443	0.280	0.182
Injured	1.419	1.847	1.291	0.874	1.136

Five passengers were killed in train accidents in June: one at Litchfield, Ill., one at Dover, O., one at Van Buren, Ark., and two at Coon Rapids, Ia. The last-named accident was unquestionably caused by a malicious obstruction, but no clear explanation has reached us of the other cases. The derailment at Dover, on the 21st, was specially exciting, the excursion being a large one. The

engine was running tender first, and it seems quite likely that a critical investigation might throw more light upon the true cause of the derailment than has yet been given. There was another derailment of a passenger train which was running tender first, that at Boulder, Col., on the next day after the Dover accident. The best judges seem very well agreed that there is risk in running trains at high speed when the leading vehicle is a tender whose wheel base is short and whose load is not only variable but constantly shifting during a large part of every journey, but nevertheless prominent roads and those usually regarded as well managed continue to run trains in this way. Moreover, this custom prevails not only with respect to suburban trains, where curves are easy and the engines or tenders perhaps more or less adapted to the service, but on longer runs as well. Engines which are not usually run in fast service and runners who have had but little experience with passenger trains are often seen running in this way. The warnings from the accident record during the last five years have not been frequent, and the deaths and damage resulting have not been especially startling, but the lesson is nevertheless quite plain; and the continuance of the dangerous practice would seem to indicate that plainness alone is not sufficient to make a lesson effective.

The collision at Sauve, La., on the 19th, was a disastrous one, but it appears that no passenger was killed, the one outsider being a man who was stealing a ride. The reports state that the train was vestibuled and that this feature undoubtedly mitigated the crash materially. The conductor and engineer who caused the butting collision at Port Costa, Cal., on the 15th, were tried in a local court but acquitted, the judge holding that there was no evidence of gross negligence on their part.

The bridge failures in this record all resulted from either fire or flood. Among the derailments resulting from defects of road will be found one on the 2d and one on the 15th, caused by expansion of rails in the hot sun, the former case being on the 2-ft. gauge, Bridgeton & Saco River road.

The disastrous derailment at Roots, Pa., on the 11th, is classed under defects of equipment, the train having broken in two; but if the reports are correct there was culpable negligence in depending for brake power on an engine at the rear of the train.

The boiler explosion at Nesquehoning Junction, Pa., on the 29th, was investigated by a coroner's jury, which took 10 days to hear the testimony and report. The verdict was that the boiler had not been inspected with sufficient frequency and that a large number of stay bolts were broken, showing old fractures. It is also held that one of the side sheets of the firebox was cracked previous to the explosion. The boiler was an old one, and the safety valve was set to blow off at 120 lbs. In addition to these points expert witnesses gave testimony which is held to prove that the water in the boiler got too low.

On the 18th there was a runaway of an excursion train on a steep grade on the Lehigh Valley near Hazleton, Pa., which, although it escaped the accident record, was tremendously exciting to the passengers. The safety switch, throwing the train upon an up-grade, appears to have been all that saved the train from destruction. Near Newport, Ky., on the 12th, a tank car loaded with gasoline exploded in the night with a shock which it is said was felt for miles around.

The position of the wealthy Britons who have invested their money in Argentine railroads is beset with growing difficulties. When they went into the development of that country with the dual hope of making money and diminishing their dependence on us for agricultural produce, they not only built new roads but bought up old ones and froze out the native officials. Many of these were men of influence, and to continue them in employment the Direccion General de Ferro Carriles Nacionales, or the National Railroad Board, was instituted, and its keep charged to the railroads. According to the *Financial Times* (London) this board "for a time kept quiet and did not give much trouble, but feeling its way it became by degrees more self-assertive. It began to call on the railway companies, guaranteed or not, for periodical returns more or less useless. These it dished up into a *pot pourri* of statistics and published as an annual report." Now a "return" is more or less objectionable to English railroaders, and they are still able to prevent any call for a return of either passenger or ton mileage in the United Kingdom. In Argentine, when "at present their rates allow them ample margin to work on by rule of thumb," and where the question is further complicated by government guarantees of income to certain lines, such returns cannot fail to be more or less useless, from the investor's point of view. When money was flowing in like water, and the whole country was booming on its borrowings, it is possible that the roads were not held to a very strict compliance, but now that no more money can be borrowed at any price the *Financial Times* finds that "at the risk of seeming to insinuate personal motives, it is necessary to speak of the National Railway Board in this connection without any squeamishness." Nor do the troubles of guaranteed roads end with the National Railway Board. A new weapon, the "Interventor," has been forged for them, of whom our contemporary says: "He is to have *carte blanche* to pick faults not only with the company's accounts but with the working of the line. All the disputes he chooses to trump up with the manager are to go first to the Railway Board, and then, if necessary, to the Minister of the Interior. Of course, the guaranteed railways kick very strongly against these 'Interventors'—the latest freak of the Argentino as a railway man—but they will not be easy to shake off." And the Argentino owes so much that he will have to be "carried" for many years.

The successful voyage of the whaleback steamer Charles W. Wetmore from Duluth to Liverpool, with a cargo of wheat, is an event of unusual interest, and brings the plans of the Lake shipbuilders to the front. Captain McDougal says that mills for the construction of steel plates, angle iron and bolts will be completed at Duluth in 90 days, and his company will immediately lay the keels for 10 more whaleback boats for service on the Atlantic. The Captain also says that they will build at least one high-speed whaleback steamer for service during the World's Fair. This will be 450 ft. long, with accommodations for 2,000 passengers. The craft will be cut in two and sent to the Atlantic when the fair is over. The Wetmore on its return will take machinery, etc., to Puget Sound for a shipyard there.

It has been erroneously stated that contracts have been let for the cable and steam plants, and for various parts of the structure connected with the rearrangement of the terminals of the New York and Brooklyn Bridge. The fact is that no work whatever has been done in this connection, except such as was made necessary by the bridge service as it now is, and no contracts have been let. Bids for the auxiliary cable-driving plant were opened July 20 as follows: R. Poole & Son Co., $63,556, and Southwark Foundry & Machine Co., $71,150. The plans for the New York end are not even definitely settled and will not be till negotiations now pending with private property owners are completed. At the Brooklyn terminal a similar cause for delay exists in the task of bringing about an agreement between the various railroad companies.

As we have before noted the Baldwin Locomotive Works are building a lot of 21 × 26 ten-wheelers for the Erie road which are probably the largest 10-wheelers yet built in this country. They have just received instructions to compound one of these engines. It will be finished about the end of September and an exhaustive test will be made of it in comparison with a simple engine of identical design in every way except the compound action.

TRADE CATALOGUES.

Instruction in the Use of Universal and Plain Grinding Machines for Cylindrical and Conical Surfaces. Brown & Sharpe Manufacturing Company.

This volume of 160 pages should be in the hands of every young machanic, and a good many old ones for that matter, as it contains information bearing directly on the modern methods of the accurate reproduction of details of machinery. Probably no better information is in print regarding the care and use of grinding machinery, the selection of emery wheels and the use of standard gauges and callipers in every-day machine-shop practice.

Starting Valves.—Mr. F. W. Dean has issued a circular describing his patent starting valve for two-cylinder compound locomotives. It is a pamphlet of 10 pages and discusses at some length the action of his convert ing valve and intercepting valve, and also the necessity for starting gear on compound locomotives generally.

The Omaha Bridge Suit.

The suit of the Chicago, Rock Island & Pacific to compel the Union Pacific to carry out the provisions of the 999-year lease, under which Rock Island trains may run over the Union Pacific Bridge at Omaha, was decided on Monday, in the Federal court of Omaha, in favor of the Rock Island. It will be remembered that the lease, made while Mr. Adams was President of the Union Pacific, was repudiated by that company as soon as the Gould management took charge of the road, on the ground that the Rock Island would use its privilege to do through passenger business in competition with the Union Pacific. It was claimed that the Union Pacific directors had no legal power to execute such a contract; their responsibility to the United States Government, especially, being a bar to such action.

The decision was by Justice Brewer, and the contract, as made by the Adams administration for the lease of the bridge to the Rock Island and the Chicago, Milwaukee & St. Paul, was decided to be legal in every respect. The Court reviewed the building of the line from South Omaha to Beatrice by the Rock Island, and the history of the case since then. The questions presented were: First, was the instrument so authorized and executed as to be a contract of the corporations? Second, if it was so authorized and executed, was it *ultra vires*. Third, if not *ultra vires*, is it a contract of which a court of equity may compel specific performance? Fourth, if it may, ought specific performance to be decreed?

The instrument was signed and attested by the proper officers. It was approved by the Executive Committee, to which was granted, by the Board of Directors, all their powers. Authority to make such a delegation of power was given to the board by the by-laws. Power to make such by-laws was bestowed by the acts of incorporation upon the stockholders. At the regular meeting the contract was approved by all the stockholders present, being two-thirds of the entire number. The Union Pacific remained in undisturbed possession of its track, could operate all its trains and discharge all the duties it owed the government or the public. It might do all the business offered and still have a surplus use of its tracks. It is for the interest of the government that such surplus use be converted into money. To the contention that the term of the contract was for 999 years, and that before it expired the growing business of the Union Pacific would demand the use of all its tracks, the Court stated that, while the business of the Union Pacific would probably increase, yet with increased business, as a rule, come increased facilities. If a changed condition of affairs should make the full use of its tracks necessary to the Union Pacific the powers of a court of equity would be equal to the emergency. The government may step in at any time when its rights are disturbed and compel the Union Pacific fully to discharge its duties.

The rent stipulated, $45,000, was held to be reasonable. If the Rock Island should in any way abuse the privileges given by this lease, as, for instance, by running local trains between Council Bluffs and Omaha, the courts are open to furnish protection, even to the extent of canceling the lease. On the other hand the Rock Island had constructed a line from Lincoln to Omaha, and had expended $1,500,000; in reliance upon this contract, it and the St. Paul abandoned their scheme of building a new bridge.

The decree went for the plaintiff as prayed for. The same considerations require that a like decree be entered in the case of the Chicago, Milwaukee & St. Paul. At the conclusion of Justice Brewer's decision Judge Dundy gave his views, dissenting entirely from his colleague's. The Union Pacific guaranteed the Rock Island the use of a station, which the Union Pacific did not own. The Union Pacific had no right to lease it to another company. The judge also held that the laws of the state would be violated if the contract were enforced.

An application for a supersedeas was made on Wednesday, but Justice Brewer denied it, at the same time making a decree requiring the specific performance of the contract and commanding all officers and employés of the companies concerned to refrain from in any manner interfering with the prompt enforcement of the terms of contract. The request of the Rock Island that the rules of the Union Pacific be allowed to govern in the movement of trains until other rules and schedules could be prepared was denied. The Court instructed the clerk not to enter the decree upon the records until the Union Pacific had filed its notice of appeal and bill of exceptions, as it had given notice of so doing.

Mertsheimer's Variable Exhaust Nozzle.

We illustrate herewith a type of nozzle used on a number of engines on the Union Pacific with considerable success for some time past. The whole idea, as will be readily seen, is to allow of a variable exhaust and put the means of operating it into the hands of the engineer, so that when it becomes necessary to crowd the fire for a short stretch on the run, or wherever, as is frequently the case, the coal at some points is of poorer quality than the average, the nozzle may be at once enlarged and thus maintain the normal hauling capacity of the engine. This is of considerable moment on several of the branches of this system, as the coals in use range from excellent semi-hard coals to very inferior lignites.

The larger of the three castings (*A*, fig. 1) is firmly bolted down to the cast-iron nozzle pipe and the brass piece *B* is set into *A* and held with a ½-in. set screw at the side. *B* is turned with a groove at *E*, although the lip over the groove extends around only on two opposite quarters of the circle. Likewise the tongue on *C*, which fits into this, occurs only on these same two quarters, being cut away for the balance of the circle. This allows *C* to be revolved 90 degrees and dropped into *B*, and then moved around to its proper position. It will be noted that the inside lips on *B* project farther in toward the centre than those on *C*, the two sets of notches producing a cutting, revolving motion, as the exhaust passes up and out of the stack.

The rod extending out at the side of the smoke box, by which the exhaust is regulated, is fastened to the top brass *C* at the end of the arm *D*, and runs through a ferrule in the sheet to a crank at the lower end of a vertical rod, which is held by a sleeve, this latter being bolted to the boiler sheet a little back of and above the ferrule. In order to preserve a straight line motion in this horizontal rod it is connected to the crank on the vertical shaft by means of a short link. There is also a stop collar put on with a set screw both inside and outside the ferrule. To the end of the upper crank is pinned a ⅝ in. gas pipe running back into the cab, at which end is a notched graduated scale indicating the diameter of a circle, the area of which is equal to the opening in the nozzle. Figs. 2 and 3 show additional details. Fig. 4 shows a plan and a front elevation, fig. 5 an exterior side elevation, and fig. 6 the handle in the cab.

This device was designed by Mr. F. Mertsheimer and may be made with maximum and minimum openings to suit, the average on some roads being rather more than that here given.

The record obtained on one of the engines equipped with this nozzle for a year has been 28.39 miles per ton of coal, whereas for the year previous to being fitted with the variable exhaust this same engine in the same service made but 23.52 miles per ton of coal, a difference of 4.87 miles. This is an 18×24 in. engine carrying a steam pressure of 150 lbs., and running 139 miles in a little over four hours, making 20 stops and hauling from 10 to 12 coaches. With the usual force of nozzle, on approaching a stopping point with the injector on, the steam will invariably drop after the engine is shut off and the blower applied; but with this device the nozzle may be reduced in size and the blast materially increased, thus keeping up the temperature and maintaining the pressure. When running at high speeds a reduction of the area of the nozzle produces very disagreeable effects from hard riding of the engine, due to increased back pressure, and on again opening the nozzle to full size the feeling is as

if the brakes had suddenly been released, and the comparative smoothness of running is very noticeable.

This ability to reduce the tip is found of great advantage when a tank load of inferior coal is taken on, for as soon as the fire becomes dirty the exhaust may be made sharper, and thus keep the steam up. It has been noticed that, when the nozzle is at either extreme, and becomes circular with notches extending in toward the centre, the results are much better than with an ordinary nozzle of equal area. It is thought that the notches cut the steam jet, thus more completely filling the stack and producing a better vacuum.

There is now being made an arrangement by which this principle may be applied to the low nozzle and diamond stack, and we may look for some interesting results in this direction, the attachment here shown being at present used only on high nozzles and with extension front-ends.

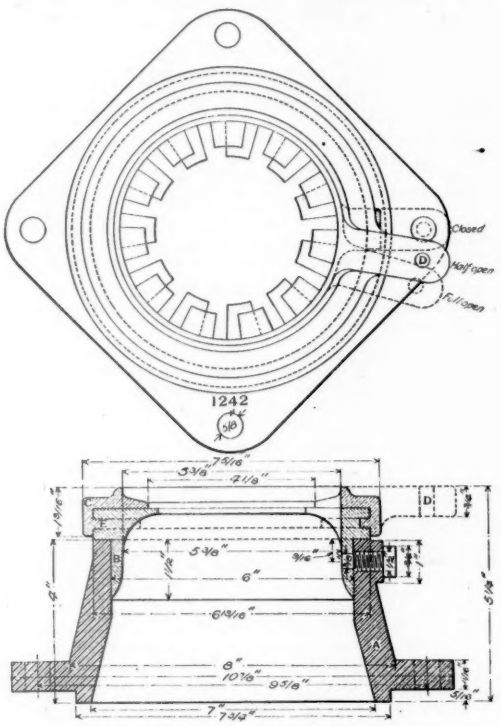

Fig. 1.

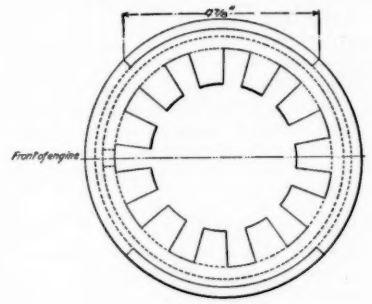

Fig. 2.

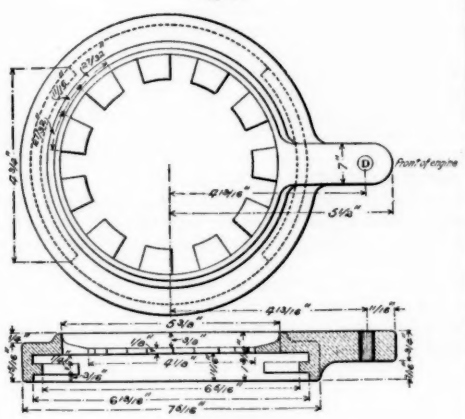

Fig. 3.

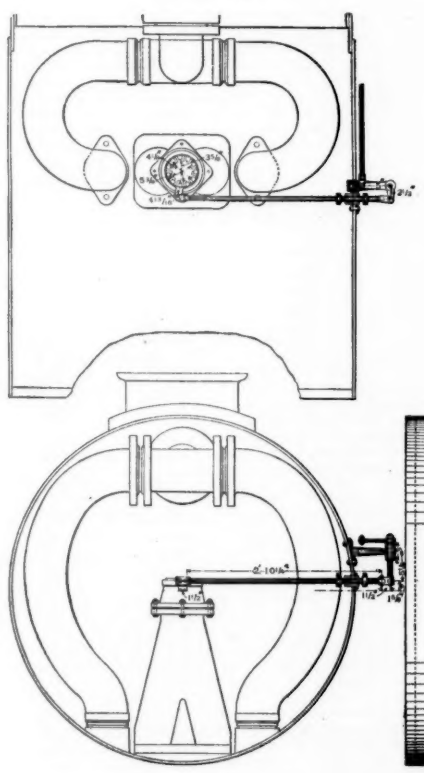

Fig. 4.

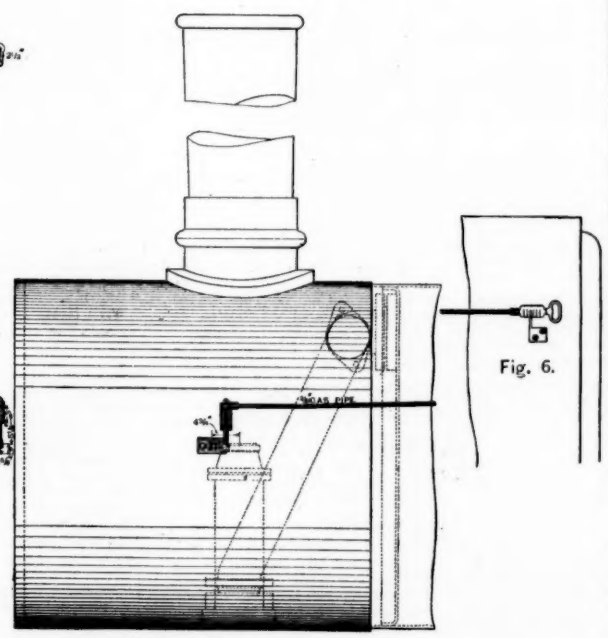

Fig. 5.

MERTSHEIMER'S VARIABLE EXHAUST NOZZLE.

Fig. 6.

The Transition Spiral.

In *The Technograph*, No. 5, published by the Civil Engineers' Club and the Mechanical Engineers' Society of the University of Illinois, Prof. A. N. Talbot, of that institution, has a paper of 27 pages on "Railway Transition Curves." This discussion of easement curves is in most respects very satisfactory, and the subject is developed quite thoroughly, but we can give space to only a very brief abstract of the paper.

The transition spiral is defined to be a curve whose degree of curve increases directly as the distance along the curve from the point of curvature, the radius being infinity at the tangent point and equal at the compounding point to the radius of the circular curve with which it connects. Its final degree of curve D is therefore the same as that of the circular curve. The rate a of increase in curvature per 100 ft. may be taken at pleasure, and the length L of the spiral will be inversely as the rate a.

Thus $$D = aL = \frac{as}{100}, \qquad (1)$$

when s = length in feet.

From the calculus the radius of curvature, $R = \frac{ds}{d\triangle}$ ($\triangle$ = central angle of spiral); and assuming that $R = \frac{5730}{D}$ and substituting, we have

$$d\triangle = \frac{asds}{573000}.$$

Integrating, we have $\triangle = \frac{as^2}{1146000} = \frac{aL^2}{114.6}$, in which $\triangle$ is expressed in circular measure (arc). To reduce $\triangle$ to degrees multiply by the factor $\frac{57.3}{1}$, whence

$$\triangle = \frac{1}{2} aL^2, \qquad (2)$$

which is the intrinsic equation of the transition spiral. No error in this result follows from the use of the expression $R = \frac{5730}{D}$, since its reciprocal is used in the final reduction back to degrees.

Since $a = \frac{D}{L}$,

$$\triangle = \frac{1}{2} DL = \frac{1}{2} \frac{D^2}{a}. \qquad (3)$$

Thus the change of direction of the spiral varies as the *square* of its length, and to accomplish this change ($\triangle$) the spiral will be *twice* as long as the circular curve with which it connects would be for the same angle $\triangle$.

The values of the co-ordinates of the spiral are reduced from an infinite series, and are found to be, along the tangent,

$$x = 100\,L - .00075\,a^2\,L^5$$

or $$x = 100\,L - .00075\,D^2\,L^3,$$

and the offset

$$y = .291\,aL^3 - .00000158\,a^3\,L^7$$

or $$y = .291\,DL^2 - .00000158\,a^3\,L^7.$$

The deflection angle (θ) from the tangent is proved to be very near $\frac{1}{3}\triangle$, with an error of one minute for $\triangle = 25°$ and decreasing rapidly for less value, and therefore the formula is adopted,

$$\theta = \tfrac{1}{3}\triangle = \tfrac{1}{6} aL^2 = \tfrac{1}{6}\frac{D^2}{a}. \qquad (9)$$

For correction between 20° and 40° subtract from this value $.000053\triangle^3$ as minutes; ($\triangle$ in degrees).

The deflection at the terminal point of the spiral between long chord and tangent will be $\frac{2}{3}\triangle$ or 2θ, subject to the correction when $\triangle$ exceeds 20°.

In order to find the deflection angle at any point on the spiral for a second point, it is demonstrated that the spiral departs from its osculating circle (circle of same radius at a given point and with a common tangent) at the same rate that it departs from the initial or main tangent. The deflection, therefore, at any point on the spiral from a tangent through that point to any other spiral point, is equal to a circular deflection for the same distance *plus* or *minus* the spiral deflection from the main tangent for an equal distance. The *plus* sign is used when running *from*, the *minus* when running *toward*, the main tangent or initial point.

This rule, however, like the preceding, must be taken subject to slight corrections, but these may generally be neglected.

The offsets from osculating curve to spiral have the same value as corresponding offsets from main tangent to spiral, *i.e.*, for equal distances along the curve.

Formulas are deduced for the co-ordinates of the tangent point of the circular curve produced backward to a parallel tangent, also for tangent distance, external distance, long chord of spiral, and its middle ordinate, and for other chord ordinates.

The offset o between parallel tangents is found to be

$$o = .0725\,aL^2 = .0725\,DL^2.$$

If o is given in a given case, a may be calculated after finding L for the given value of D. But generally a will be determined beforehand. The author recommends $a = 2$ for high speeds and a 6° maximum, $a = 10$ for curves up to 16°, and $a = 25$ as a limiting value on elevated roads, etc.

Tables are given of values of required functions for $a = 1$, 10, and $3\frac{1}{8}$ for various lengths of curves from 10 ft. to 450 ft., and the method of field work is fully explained. Several problems are briefly discussed.

Since the deflection may be calculated for any distance on the spiral, the regular stationing may be kept up if desired, and if necessary a transit point may be taken anywhere on the spiral.

The paper concludes with an extensive review of other discussions of this subject, noticing the spiral of Mr. Elliot Holbrook (published in the *Railroad Gazette* Dec. 3, 1880), the same curve as the above, but differently discussed; the tapering curve of Mr. Wm. Hood, Chief Engineer So. Pac. Ry.; the railroad spiral of Mr. Wm. H. Searles; the Cubic Parabola, and the "Pennsylvania method." The criticisms are very fair, and the author will be pardoned for showing a slight preference for his own method, which is certainly handsomely developed. He has failed to mention the diagrams published about 1859 by Mr. Anthony Jones, the "Tables of Compound Curves," by Aug. Torrey, C. E., 1880, both relating to the "tapering curve" in varying forms, and some more recent articles that have appeared in the *Railroad Gazette* in relation to this subject.

The concluding paragraphs of the paper relating to the practical utility of spirals in general deserve quotation in full.

"The objection is sometimes raised that even if track is laid out with a carefully fitted spiral there would be no possibility of keeping it in place by the methods of the ordinary track man. This identical objection could be made with the same force against carefully laid out circular curves, yet no engineer would recommend abolishing that practice. Even if, in re-lining, the transition curve is considerably distorted, it remains an easement, and will be in a far better riding condition than a distorted circular curve. By marking the P. S. and the P. C. C. with a stake or post, with possibly on long spirals an intermediate point, the track man will be able to keep the spiral in as good condition as though it were of uniform curvature.

"Properly constructed spirals would frequently allow the use of sharper curvature—since the riding quality of curves may be the governing consideration in the selection of a maximum—and thus make a saving in construction. By fitting curves with proper transition spirals, roads using sharp curves may partially relieve the objection of

the public to traveling by their routes. The transition curve has, then, a financial value largely overbalancing its cost. The adoption of such curves by many of our principal railways proves their efficiency, and the future will see a much more general adoption."

This paper complete can be had by addressing *The Technograph*, University of Illinois, Champaign, Ill. The price is 50 cents.

Starting Gear for Compound Locomotives.

18 *St. Dunstan Hall*,
LONDON, E. C., July 6, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Judging by his remarks, Mr. F. W. Dean would appear to have given considerable attention to compound locomotives, but it is evident that he has not been led to his conclusions by any personal experience with Lindner engines, to the starting gear of which, although recognized by him as simple, cheap and ingenious, he assigns a position inferior to that of the intercepting valve. The reasons given by Mr. Dean for favoring the intercepting valve are:

1. If an intercepting valve can be produced as cheaply as the Lindner starting gear, the former is preferable.

2. The Lindner gear must necessarily be unsatisfactory, because several improvements have been carried out in it.

3. That in the Lindner system a continuous leakage of steam takes place through the channels of the high pressure slide valve into the receiver, and that this causes a considerable waste of steam.

The first two of these statements scarcely require contradiction, because, if the result obtained by the two systems is the same, the simpler (the Lindner) must always merit the preference. Throughout its stages of development, and until its completion, it has maintained the credit of being the simplest and cheapest.

The third objection raised has at first sight apparently some semblance of justification, which, however, entirely disappears on a more careful examination.

In addition to the observations in your issue of May 15 by "A Friend of Compound Locomotives" we are in the position further to demonstrate the fallacy of the third objection, by means of the graphical diagram of the tractive force for the various positions of the cranks (given by us in your issue of March 27), and based upon two series of indicator diagrams taken with a goods engine, at a minimum speed and also when running fast. The first series shows the normal conditions, namely, the high-pressure slide valve with the channels open; and the other series shows the conditions altered, by these channels being purposely closed. As shown by our diagram, any action of these channels ought to, and can, only take place on starting—that is to say, when the admission of steam is at its maximum; and thus only during the last quarter of each semi-circle of the high-pressure crank path during the period of expansion and compression.

While running—that is to say, with less admission of steam—the action of the openings can, in consequence of the greater period of expansion, extend to a greater portion (up to one-half) of the crank semi-circle; while also, as the admission of steam is reduced the period of cushioning increases, and consequently the effect of the channels must increase during the same. It is thus evident that there is no continuous leakage of steam into the receiver, as Mr. Dean supposed.

The diagrams of the runs with the Lindner channels thus open only show, at all speeds, even at the minimum, quite a trifling passage of expanding steam going to the receiver, as also a stream of compression steam going to the same, which is more noticeable in consequence of the small volume which is compressed. A slight increase will thereby be caused in the pressure in the receiver, as well as a reduction in the compression, there being thus, without any reduction in the net duty of the engine, a small reduction in the duty of the high-pressure cylinder and a small increase in the duty of the low-pressure. In the case of a two-cylinder compound it is necessary for early cut-offs to increase the admission to the low pressure cylinder above the high-pressure in order to bring the duty of the low-pressure nearly up to that of the high-pressure. Also, to diminish the cushioning resulting from the pressure in the receiver, the high-pressure slide must have inside clearance; therefore the small relief passages in the high-pressure slide valve of the Lindner engine are not only harmless while running, but even work advantageously by distributing more equally the work of both cylinders; and their good effect increases the more in proportion as the admission of steam is earlier cut off.

The diminution of cushioning by means of the small channels also permits of a reduction of the inside opening of the high-pressure slide valve, thus prolonging the period of expansion. The comparative results obtained on the Saxon state railroads, in a traffic now extending over several years, with compound locomotives of precisely similar dimensions, running on the same line and in the same service, one-half of these engines having the intercepting valve and the other half the Lindner arrangement, have decidedly shown no advantage for those with intercepting valves. On the contrary, the saving in coal, which amounts with them to 17½ per cent., is a trifle less than that with the Lindner locomotives. It is also a striking fact that those German railroad directors who have introduced Lindner engines on a large scale continue to order more of them, while an increasing number of railroads are making trials with them; so that during the comparatively short period which has passed since the introduction and perfection of the invention more than 200 locomotives have been or are now being fitted with it, two-thirds of them being already running in traffic.

A few words, in conclusion, as to the letter from "A Friend of the Compound Locomotive," to whom we are extremely indebted for his friendly and *apropos* criticism of the Lindner starting gear. The trials and experiences of several years with two-cylinder locomotives, as well as the study of our graphical diagram above referred to, have shown that it is impossible to do without some starting arrangement, because, without one, the locomotive cannot in certain positions be moved in the required direction. They show still further that auxiliary steam is only required for starting in certain definite positions of the cranks, and that simply to supply such steam without the use of some special arrangement causes, under certain conditions, a resistance which reduces the power available for starting.

It cannot, however, be expected of the engine driver, or even be found advisable, that he should, before starting, have to ascertain the positions of the cranks by getting off his engine, and then have to reflect as to what he has to do. The compound locomotive must start quietly and quickly, and from any position, even under the most unfavorable circumstances, any train suited to its power and to the profile of the line—at least as easily as any ordinary engine could do, and that by the driver doing exactly what he has been accustomed to do all his life with any other engine. The quiet but powerful force available for starting, the reduced number of beats of the exhaust, the absence of all priming and of the usual shower of sparks, as well as the marked reduction in the quantity of coal and water used, will soon inform him that he is driving a compound.

In publishing our letter in your issue of March 27 a mistake has occurred in describing the diagram; the scale of the tangential forces is: 300 kg. = 1 mm. and not 1 kg. = 1 mm.

HOPE & CO.

TECHNICAL.

Manufacturing and Business.

Application has been made for a charter for the Schoen Pressed Steel Brake Beam Co., of Allegheny, Pa. The new company will succeed the present firm known as the Schoen Mfg. Co., manufacturers of brake-beams and pressed steel articles for railroads. The incorporators are Chas. T. Schoen, Henry W. Oliver, W. A. Schoen, Sr., Edward Atley Schoen and W. H. Schoen, Jr.

Articles of incorporation of the Wrought Steel Wheel Co. have been filed in New Jersey. The capital stock authorized is $2,000,000, and the incorporators are William P. Shinn, of Pittsburgh; Smith M. Weed, George W. Bentley, Edward A. Smith and Nicholas W. Nevan, of New York, and James W. Roach, of Camden. The company will manufacture wrought solid steel car-wheels for railroad use. Mr. Shinn will be President.

Iron and Steel.

The muck bar and plate mills of the Roanoke (Va.) Iron Co. are about completed. The former will be 332 × 76 ft. in size, and the latter 304 × 84 ft.

The Solid Ingot Co., of Newark, N. J., has arranged to introduce its reversing process in the steel works of the La Belle Steel Co., Howe, Brown & Co., and the Detroit Steel & Spring Co.

The Caponsburg Iron & Steel Co., of Pittsburgh, is making extensive improvements and additions to its plant at Canonsburg, Pa. The company has placed an order with the Leechburg Foundry & Machine Co., of Pittsburgh, for a 22-in. sheet mill.

The stockholders of the Scottdale Iron & Steel Co., of Scottdale, Pa., have elected P. S. Loucks, President; J. B. Stauffer, Treasurer, and Clark Grazier, Secretary.

The Rail Market.

Steel Rails.—Only sales of small lots, none exceeding 1,000 tons, are reported by Eastern mills, and the market remains practically unchanged, with quotations at $30.

Tie Preserving.

Mr. Octave Chaunte has issued a circular letter which we publish below: "Having under my recent visits to Europe gathered further data concerning the methods and results of preparing wood chemically to resist decay, I am confirmed in the opinion that the time has now fully arrived when large economies may be realized by adoption of these methods on American railroads, in many parts of this country. I propose to make this a specialty, and I am prepared, in connection with the Chicago Tie Preserving Co., to design, erect and operate works for preserving wood, either on commission or at our own expense, upon adequate contracts.

"I have lately examined some experimental railroad ties of the most perishable kinds of wood prepared by the Zinc-Tannin (Wellhouse) process in St. Louis in 1881 and 1882, and laid in the tracks of the Atchison, Topeka & Santa Fe R. R., at Topeka, Kan., and La Junta, Colo. After 9 or 10 years' exposure they show the following results for woods which would have lasted but from one to four years if unprepared.

Kind of wood.	No. of Ties.	Date Laid.	Per cent. now in track.	Time of exposure.
Cottonwood	87	Aug. 1, 1882	49.4	8.92 years.
Sweet Gum	51	Aug. 1, 1882	19.6	8.92 "
Red Oak	48	Aug. 18, 1882	60.4	8.85 "
Black Oak	49	May, 1882	100	9.1 "
White Cottonwood	49	May, 1882	96	9.1 "
Cottonwood	50	May, 1882	92	9.1 "
Colorado Pine	50	July, 1881	100	10. "

"Unprepared ties of the same kind of timber, laid at the same time, adjoining to these prepared ties, have all decayed and been taken up, while present appearances indicate that the prepared red oak, black oak and Colarado pine ties are likely to show an average life of 10 to 15 years or more. The Chicago, Rock Island & Pacific made a contract in 1886 with the Chicago Tie Preserving Co. to erect works in Chicago and to treat hemlock ties by the same process. After five years' experience this contract has lately been renewed for an increased annual output. This road and the Atchison each has in its tracks over one million of ties treated by the Zinc-Tannin process. Not only does the Zinc-Tannin process preserve ties against decay, but it hardens them as well. It is found on the C., R. I. & P. that after three years' exposure treated hemlock ties hold the spike as well and cut less under the rail than untreated white oak.

"I am convinced by experience that on many railroads where white oak is getting scarce an economy of at least $100 a year per mile of track can be effected by preparing ties of inferior kinds of wood to resist decay by the Zinc-Tannin process."

Eucalyptus Fluid as a Disincrustator for Boilers.

The report of the East Indian Railway states that experiments have been made on the Chaman Extension, Eastern Bengal, Northwestern, and Oudh & Rohilkhand railroads with a fluid extract of the leaves of the Eucalyptus to prevent the formation of scale in boilers with satisfactory results so far in all cases; but the experiments are not complete, and are being continued.

A Big Armor-Plate Ingot.

A press dispatch says that "at the armor plate mill, of Carnegie, Phipps & Co., at Homestead, an armor ingot has been cast, 80 in. wide and 23 in. thick, weighing 32,000 lbs. It is the largest armor-plate ingot ever rolled in this country. The ingot was cast in a sand mould and was found not to contain a single flaw. It is more than likely that hereafter sand moulds for turning out armor-plate ingots will be adopted."

Compressed Gas for Lighted Buoys.

The Lighthouse Board has made arrangements to put on the Lakes six buoys to be lighted by Pintsch gas. They will probably be placed as follows: One on Ballard's Reef, Detroit River; two at the upper entrance to the St. Clair River; two on Poe's Reef and Graham Shoals, and the sixth on Gravelly Shoals. The tanks attached to the buoys will store gas enough to burn for 90 days.

The Largest Ore Dock in the World.

This is the title given by the *Iron Age* to a description which it prints of the new ore dock at Escanaba, Mich., which has a capacity of 45,000 tons, and reaches 2,300 ft. from the shore. This dock was built for the Escanaba, Iron Mountain & Western Railroad, but that line has now fallen into the hands of the Chicago & Northwestern, and it is said that this company will use the road in connection with its own existing line as a double-track road between the docks and the mines. This dock rises 52 ft. above the water, and has balanced hoists by which two men raise or lower a spout in about 10 seconds. There are 232 pockets, fixed at an angle of 40 degrees. The principal contractors were McIntosh Bros., of Milwaukee. The pile work was done by the Chicago Dredge and Docks Company, and the timber work by R. B. Dear, of West Superior, Wis. Water jets were used in driving the piles, of which there are 5,309 in the dock and 1,225 in the approach, the latter being reached by a 126-ft. Howe truss. The total quantity of piling was 224,561 lin. ft., and of timber 6,434,331 ft. board measure. The dock proper is 1,427 ft. long, and the approach 2,091 ft. The cost of the whole was $281,604.

Wrought-Iron Pistons.

The Baldwin Locomotives Works have systematically taken up the manufacture of wrought-iron pistons. Immediately after the question was agitated and the railroad public began to appreciate the advantages of lighter pistons, the Baldwin Works commenced work on a scheme for their manufacture. The process used is similar to that which they have adopted for making wrought-iron driving and truck wheels. Already a number of them have been made and the 17 compounds for the Central Railroad of Brazil were fitted with these pistons. Probably all high-speed engines will be built with these in the future. The advantage gained far exceeds the additional cost.

Patent Insurance.

The latest thing in insurance has just started in Washington, in the shape of The United States Patent Guaranty Company, of which ex-Senator John J. Ingalls is President. Something of the mission of the corporation may be inferred from its name. It proposes to treat property in patents in much the way that the title-insurance companies treat property in real estate. Incidentally this unique organization will undertake the capitalization and exploitation of valuable patents, in regard to which it will occupy the relation of trustee. As a patent trustee, the Guaranty company will be in a position to protect minority interests. Patentees with the certificate of the United States Patent Guaranty Company will more readily secure a hearing from capitalists, while inventors will find backing to protect them from the interests opposed to their possible competition. The names of several leading capitalists and business men appear in the published list of founders and directors.

THE SCRAP HEAP.

Notes.

A fire in the Central Pacific freight yard at Ogden, Utah, last week, destroyed a freight shed and 10 cars. Total loss, $20,000.

There have been small strikes of freight trainmen on the Cincinnati, Jackson & Mackinaw, chiefly at Van Wert, O., and on the Cleveland, Cincinnati, Chicago & St. Louis, at Springfield, O.

The Secretary of the Brotherhood of Railway Carmen, Mr. F. Keliher, is traveling through the western states organizing branches of his association. He tells a Chicago paper that he is making rapid progress. The organization is made up of car inspectors, repairers and oilers who are "male white persons between 18 and 60 years of age."

The Southern Pacific and the Rio Grande Western have issued a circular advising all connections that after August 1 they will refuse to receive any cars not equipped with automatic brakes. Hitherto they have accepted freight cars without power brakes, provided they were piped, so as not to prevent the use of air on other cars in the same train.

The annual report of the railroad mail service in the division comprising New York, Pennsylvania, New Jersey, Delaware and parts of Maryland and Virginia,

shows the total number of postal clerks assigned to the distribution of mail in transit to be 726. During the past five years the working force has been increased 13 per cent.; the amount of mail distributed has increased 36 per cent., and the errors in distribution have increased less than 10 per cent.

Another track is to be laid in Green street (Buffalo), and all light engines, as well as the switch engines, will be required to run over it, instead of going up and down through the trainhouse as they do now, filling everybody with terror. Now, if to this shall be added an order forbidding the "popping-off" of New York Central engines, a very reprehensible practice will be stopped. It is a nuisance not allowed on the Lake Shore or Michigan Central engines.—*Buffalo Paper.*

On the Sacramento division of the Central Pacific it takes 28 crews to handle the business, and they are worked pretty hard. On the Truckee division five freight crews have to do all the work, there having been no increase of force since the rush commenced. These five crews have to run night and day, and the only sleep the train hands can get is when they are "dead-heading" from Wadsworth to Truckee. It is questionable economy to make the men work this way.—*California Paper.*

The Delaware, Lackawanna & Western is building an extensive plant at Hoboken, N. J., which will be used for generating electricity, gas and steam power. The building will be divided into different apartments for a gas plant, boiler-house and electric-light-house. The boiler-house will contain eight 100 H. P. boilers to be set in batteries of four each. The building will be constructed of brick, 16 ft. high, with iron roof and girders. The boiler plant will furnish steam for running the gas compressors and electric-light engines, and will also be utilized for heating the offices, buildings and passenger cars throughout the yard. The Pintsch gas system is being put in.

Foreign Notes.

The first half of the Jaffa-Jerusalem Railroad, reaching from Jaffa to Ramleh, a distance of about 25 miles, has been completed. The remaining portions of the road are to be finished within a year.

The Egyptian government has granted permission to the Suez Canal Company to build a narrow-gauge railroad along the banks of the canal from Ismailia to Port Said, under the condition that the road is to serve only the uses of the company in properly maintaining the canal service.

The French Department of Public Works has issued to the various railroad companies a circular letter recommending the provision, in every train, of at least one smoking compartment for each class of passengers, and the substitution for the placard hitherto carried on the outside of such compartments of a proper inscription painted on the body of the car.

According to the *Verhehrs Zeitung*, the project of a belt railroad for Berlin, which is to connect the several small outlying towns and to intercept all the railroad lines leading into the capital at points about 5 miles distant, is assuming definite shape. Plans for the road have been submitted to the Department of Public Works, the right of way has already been secured in part, and it is expected actual construction work will be soon commenced.

A street railroad operated by petroleum motors is shortly to be opened near Prague, in Austro-Hungary. No very definite information is given of the mechanical arrangements to be adopted beyond that each car is to be fitted up with a small, horizontal, petroleum engine, which is to transmit power to the car axles by gearing. J. E. Bierenz, of Vienna, who represents the interests of the Daimler petroleum engine, one of the more recent designs, is said to be one of the movers in the enterprise.

Missouri Railroad Valuation.

The Missouri State Board of Equalization has completed the assessment of railroad and bridge property for the ensuing year.

The values fixed by the Board, as compared with the previous year, may be summarized thus:

ITEMS.	1891.	1890.
Roadbeds	$48,596,187	$47,121,398
Rolling stock	9,257,501	8,928,458
Buildings on right of way	1,205,785	1,221,055
Bridges	2,264,000	2,250,000
Telegraph lines	840,975	799,047
Totals	$62,164,448	$60,322,959

This shows an increase over the assessment of 1890 of $1,842,846.60. The number of miles of railroad in operation in the state on June 1, 1890, was 5,901.63, which shows an average assessed value of $10,380 per mile.

The slight decrease on the value of "buildings on right-of-way" is attributable to the omission of certain buildings which have become subject to local assessment.

The returns of mileage show the following differences as compared with the returns for 1890:

GAINS.		
By corrected measurements in 1891		6
By extension of old lines		17
By construction of new lines		42
		65
LOSSES.		
By corrected measurements	5	
By roads abandoned	22	
		27
Net increase in mileage		38

The new roads assessed for the first time this year are the Mississippi River and Bonne Terre, 31.70 miles, and the Williamsville, Greenville & Northeastern, 10 miles. The roads torn up and abandoned, and consequently lost to taxation, are the Clarinda & St. Louis, 10 miles, and the St. Joe Railway, 12.50 miles.

Illinois Central Station in Chicago.

A Chicago paper renews the report, apparently with some semblance of authority, that the Illinois Central and Michigan Central will soon begin to erect a new passenger station in place of the "ruin" at the foot of Lake street, now used, which is a relic of the fire of 1871. This is what President Fish, of the Illinois Central, is credited with saying, when spoken to: "Yes, we have at length come to an agreement with the Michigan Central for a rearrangement of the tracks and the building of a joint passenger station on substantially the old site, enlarged. The new building will occupy a space measuring 220 ft. in width on Randolph street, extended, and 750 ft. on Central avenue, reaching from Randolph street to South Water street. The general plan may be described as follows: The train shed, 600 ft. in length and 170 ft. in width, will cover, with a single span, 10 passenger tracks. The principal entrance will be on South Water street, and the principal exit on Central avenue near the foot of Lake street. The Illinois Central will put up an office building at the corner of South Water street and Central avenue, over the general waiting-rooms. The space east of the train shed will contain baggage and mail tracks. It is said that the new station will be so arranged that it can be easily changed to a frieght station whenever the company may conclude to build a passenger station further south.

Wisconsin Railroad Commissioner's Report.

The fourth biennial report of Railroad Commissioner Peterson, of Wisconsin, for 1890, has just been printed. The total mileage in the state, Dec. 31, 1890, was 5,475, a total increase in two years of 191 miles. For the year ending June 30, 1890, the passenger mileage in the state was 242,988,101, and the rate per passenger per mile was 2.416 cents. The number of tons of freight carried one mile in Wisconsin was 186,042,952, and the average rate per ton per mile was was 95.718 mills. The average haul was 131.56 miles. There were four passengers killed during the year.

Solving the Separate Car Problem.

Texas sheriffs now have lots of trouble complying with the law which forbids whites and blacks to ride together. At Sherman, the other day, Conductor Legg solved the difficulty by getting the officer to chain his black prisoner to a seat next the partition in the car. The door was then propped open and the officer took his seat on the seat in the white side next to the door. On the St. Louis Southwestern the same difficulty came up. The conductor settled it by giving the officer a stool and letting him sit on the platform.

Virginia Railroad Taxes.

The assessment of the property of the railroads of Virginia this year provides for a tax levy of $195,000. This is $23,442 more than last year. The report of the Board of Assessors shows that the total mileage in Virginia of railroads and canals—the former also embracing the street-car lines—is 3,177. The mileage one year ago was 3,072. In addition to this tax there arises from the levy of 1 per cent. on the net income of the various corporations the sum of $2,862. The total value of all property, real and personal, held in Virginia by transportation companies, is valued at $48,034,191. The valuation last year was $42,450,843.

Speed of Electric Signals Through an Ocean Cable.

Recent experiments at McGill College, Montreal, under the auspices of the British and Canadian governments, to ascertain the longitude of Montreal by direct observations from Greenwich, have led to the determination of the length of time it takes a telegraphic signal to cross the Atlantic. The land line was worked into the cable by a repeater, and a circuit was arranged so that the signal sent from Montreal would go over the land lines to Canso, N. S.; thence over the cable to Waterville, Ireland, and return to Montreal again. Attached to the sending and receiving apparatus was a chronograph, which measured the time. Out of 200 signals sent, it was found that the average time taken to cross the Atlantic and back again—about 7,000 miles—was a trifle over one second.

LOCOMOTIVE BUILDING.

The Brooks Locomotive Works last week delivered the last of an order for ten 10-wheel freight engines for the Lake Shore & Michigan Southern.

The Cooke Locomotive Works are expected to resume next week, employing about the usual number of men, 1,500. Since closing down large orders have been received from several Western roads.

The Schenectady Locomotive Works have built for the New York Ceneral three heavy suburban locomotives, which will run between New York and Yonkers. These engines resemble the Forney type, having six driving wheels coupled, a single pair of small wheels under the front end, and the frames extending back sufficiently to carry the coal and water, this end being supported by a six-wheel truck. The weight on drivers is 90,000 lbs. Anthracite coal is used.

The stockholders of the New York Locomotive Works, at a meeting at Rome, N. Y., July 24, authorized the directors to increase the capital stock $400,000 by issuing $100,000 additional first preferred stock, entitled to eight per cent. dividends, non-cumulative. In addition, $100,000 of new six per cent. mortgage bonds, running 20 years, were authorized. The new stock and bonds were offered to the present stockholders, and the entire sum has already been subscribed, although it had been proposed to keep the subscription books open to Aug. 1. The new stock has been issued principally to meet the expenses of changes in the plant, and for a large number of new tools recently purchased.

CAR BUILDING.

The Canadian Pacific is reported to have just placed an order for over 500 freight cars.

The Litchfield Car & Machine Co. has an order from the Kansas City, Fort Scott & Memphis for 400 box cars.

The Terre Haute Car & Mfg. Co. has completed the last of an order for 300 cars for the Wheeling & Lake Erie.

Mr. W. W. Greene, the inventor, has a train of steel cars on exhibition at Chicago which is attracting considerable attention. In addition to the five new cars exhibited, he also exhibits a steel postal car which was placed in service on the Louisville, New Albany & Chicago in February, 1889, and which has run over 270,000 miles.

The East street shops, in Springfield, Ohio, were sold last week to the Cleveland Car Co., composed of Cleveland, New York and Chicago capitalists. The price agreed on is $290,000, two-thirds of the appraisement. One-third of purchase money is to be paid in 60 days. The company will put the plant in operation at once.

BRIDGE BUILDING.

Alexandria, Ia.—The United States army engineers have finally approved the location of the bridge of the Houston, Central Arkansas & Northern over the Red River at Alexandria. The Union Bridge Co. has the contract. The draw will be 180 ft. in the clear.

Bridgeboro, N. J.—A new iron drawbridge is to be erected over Rancocas Creek at this place.

Hagerstown, Md.—The County Commissioners of Washington County will build new bridges over the creek at Gann's Mill, near Smithsburg, and over Little Conococheague, in District No. 13.

Leavenworth, Kan.—A. J. Bullock, proprietor of the Missouri Valley Bridge Works, and S. W. Snyder and others, of Leavenworth, are organizing a company to build an iron bridge over the Missouri River, to replace the pontoon bridge.

Newport, Minn.—The question of issuing $35,000 in bonds for the purpose of building a bridge over the Mississippi River is to be decided at an election to be held this week.

New York City.—A. P. Boller, of New York, has submitted revised plans for the drawbridge over the Harlem River on Seventh avenue at 155th street. The bridge proper is to cost $850,000 and the approaches about $400,000. The appropriation is $1,250,000.

Spokane, Wash.—The contract has been let to the Smith Bridge Co., of Toledo, O., for building the approaches to a cantilever bridge on Monroe street for $25,800.

Proposals have been asked for the erection of a bridge on Division street, by H. G. Stimmel, City Clerk.

Sutersville, Pa.—A company with a capital stock of $50,000 has been organized by Matthew Osborne, Frank O. Bingham, John A. McCune, James E. Douglass and A. L. Cornell to build a bridge over the Youghiogheny River at Sutersville, in Elizabeth Township, about 15 miles above McKeesport.

Tonawanda, N. Y.—The Hilton Bridge Construction Co., of Albany, N. Y., has been awarded the contract for the building of a bridge over the Erie Canal at this place, the amount being $14,000.

Tuscaloosa, Ala.—The County Court has ordered the construction of a new bridge over North River at Bull Slough.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Iowa the Supreme Court rules that the provision of the state law, relating to through joint rates, that carload lots shall be transferred from one line to the other without unloading, unless such unloading is done without charge to the shipper, is not unconstitutional, as a taking of property, or its use, without the consent of or compensation to its owner. The fact that the joint rates are fixed by special proceedings before the Commissioners, under the Iowa joint-rate act, after notice to the railroad companies interested, does not constitute a taking of their property "without due process of law."[1]

The Supreme Court of the United States holds that a stipulation in a contract that a sleeping-car company shall have the exclusive right for 15 years to furnish drawing-room and sleeping cars for a railroad company's use, does not render the contract void as being in restraint of trade or against public policy, as such stipulation does not disable the sleeping-car company from furnishing cars to a rival railroad, and the law will imply, from the terms of the contract, that it must furnish the railroad company in question not only adequate and safe cars, but sufficient in number for the use of the public traveling on the latter's road.[2]

In Iowa the Supreme Court rules that an agreement between a member of a firm engaged in procuring and selling options for coal lands and a railroad company, to pay such member a commission on the sale, when not fraudulent as to the company, will not, on appeal, be declared void, as against public policy, because of a condition to keep secret the payment of the commission, where the evidence is conflicting as to whether or not the other partner had knowledge of the agreement.[3]

In Texas the Supreme Court rules that when the receiver of a railroad has been discharged by the court appointing him, the jurisdiction of the court is ended; and an order, in such decree, that the property shall be relieved from any liability on claims not established by intervention in the suit in which receiver was appointed, does not affect defendant's liability for injuries to plaintiff arising from the receiver's negligence, where it has received in improvements earnings out of which plaintiff was entitled to have such damages paid, though his claim is not established by such intervention.[4]

In Iowa the Supreme Court decides that the fact that a railroad, over which the Railroad Commissioners, acting under the Iowa "joint rate act," are about to fix "joint rates" with another line, traverses a portion of another state in its route between two cities in Iowa, is no ground for declaring the act unconstitutional as an attempt to regulate interstate commerce contrary to the Constitution of the United States, since it will be presumed that the Commissioners will not fix a rate between those cities if it be unlawful to do so.[5]

In Vermont it is held that the tax law of the state imposing a tax upon the entire gross earnings of all railroads operated in the state, and providing that if a railroad be situated partly within and partly without the state the tax shall be proportionate to the mileage of trains run within the state, is unconstitutional, as an interference with interstate commerce.[6]

In the Federal Court it is decided that a city ordinance prohibiting any railroad company from allowing the sale of fruit, vegetables or perishable freight arriving in the city over its lines from cars on the tracks, from any platform, shed or building at the depot on the grounds of the company, is, where the merchandise affected largely comes from other states, an interference with interstate commerce, and, if not based on considerations of public health, or intended to prevent the crowding and obstruction of streets and public places, but solely to hinder competition between non-resident shippers and resident licensed dealers in the same line, it is unconstitutional and void.[7]

Injuries to Passengers, Employes and Strangers.

In Texas it is ruled that under the law declaring the intersection of two railroads to be a depot where the companies must receive passengers, and article 4226, requiring passengers to be carried to and from such junctions on payment of the legal fares, and the statute requiring ticket offices to be open half an hour prior to the departure of trains, and authorizing a charge of only three cents a mile by the conductor if the offices are not so open, a company is liable for the ejection of a passenger from a freight train, who gets on at a junction where there is no ticket office, notwithstanding its rule that passengers without tickets cannot ride on such trains.[8]

In New York, in an action by a passenger against a railroad company for money stolen from him while asleep in a sleeping car, it appeared that the only employé kept on the car while it ran from New York to Boston, making eight stops on the way, was a man who acted as conductor, porter and bootblack. The Supreme Court rules that defendant had not exercised due care in protecting its passengers while asleep.[9]

In Kentucky, a train having parted, the engineer ran

ahead with the front section and whistled for brakes, repeating it so often as to alarm the people along the road. He ran on thus 2½ miles, passing one station, and then checked the front section, and almost as soon as he did so the rear section ran into it, injuring a brakeman on the engine so that he died after nine hours, during which he was unconscious. The other brakeman and the conductor were in the caboose, and had not discovered that the train had parted. The Court of Appeals decides that the conductor was willfully negligent, and that the case justified an award of exemplary damages against the company.[10]

In Minnesota the Supreme Court rules that a railroad section hand who is injured by the negligence of a fellow-servant in operating a hand-car may recover damages against the company.[11]

In North Carolina it is held by the Supreme Court that when a railroad company leaves, in building its road, masses of rock detached by blasting along its track, some of which fall on the track, causing an accident in which a brakeman was injured, the danger is not one with knowledge of which the trainmen are chargeable, where, when on the train, they are on a level with the rock, which does not look dangerous from that point; and they will not be held to have assumed the risk unless knowledge is proved.[12]

In the Federal Court, in an action against a railroad for personal injuries at a crossing, it was shown that plantiff, a young girl, was in a carriage with her mother, and that the latter was driving when the accident occurred. The Court holds that while the mother's negligence cannot be imputed to plaintiff, it was as much the latter's duty to suggest the necessary precautions, and to protest if they were not taken, as it was the mother's duty to take them.[13]

By the California Civil Code damages recovered for personal injuries to the wife are community property, and the husband has the management and power of disposition of such property. The Supreme Court holds that the husband is a necessary party to an action for injuries to the wife, and his contributory negligence is imputable to her.[14]

[1] C. R. & N. Ry. Co. v. Dey, 48 N. W. Rep., 98.
[2] Chicago, St. L. & N. O. R. Co. vs. Pullman South. Car Co., 11 St. Ct. Rep., 490.
[3] Gleason v. Chicago, M. & St. P. Ry. Co., 48 N. W. Rep., 88.
[4] Kretz v. T. & P. R. Co., 14 S. W. Rep., 1067.
[5] B. C. R. & N. Ry. Co. v. Dey, 48 N. W. Rep., 98.
[6] Vermont & C. R. Co. v. Vermont Cent. R. Co. (Vt.), 21 Atl. Rep., 262.
[7] Spellman v. City of New Orleans, 45 Fed. Rep., 3.
[8] Eddy v. Rider (Tex.), 15 S. W., 113.
[9] Carpenter v. N. Y., N. H. & H. R. Co., 26 N. E. Rep., 277.
[10] Newport News & M. V. R. Co. v. Dentzel's Adm'r, 14 S. W. Rep., 953.
[11] Steffenson v. C. M. & St. P. R. Co., 47 N. W. Rep., 1068.
[12] Bean v. Western N. C. R. Co., 12 S. E. Rep., 600.
[13] Griffith v. B. & O. R. Co., 44 Fed. Rep., 574.
[14] McFadden v. Santa Ana, O. & T. St. Ry. Co., 25 Pac. Rep., 681.

MEETINGS AND ANNOUNCEMENTS

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Ohio, 3 per cent., payable, July 31.
Central of Georgia, 2¾ per cent., payable, July 15.
Maine Central, 3 per cent., payable, Aug. 15.
Rome, Watertown & Ogdensburg, 1¼ per cent., guaranteed, payable, Aug. 15.
Portland & Rochester. 3 per cent., payable, July 15.
Terre Haute & Indianapolis, 3 per cent., payable, Aug. 1.
Wilmington & Weldon, 4 per cent., payable, July 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlanta & Florida, annual, Atlanta, Ga., Aug. 11.
Atlanta & West Point, annual, Atlanta, Ga., Aug. 5.
Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 16.
Marietta & North Georgia, annual, Marietta, Ga., Aug. 20.
New York, Ontario & Western, annual, New York City, Sept. 30.
Richmond & Chesapeake, annual, No. 1014 Main street, Richmond, Va., Aug. 13.
Wabash, annual, general offices at St. Louis, Mo., Sept. 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Roadmasters' Association* will hold its ninth annual meeting at Boston, Mass., August 19 and 20.

The Roadmasters Association of America will hold its next annual convention at the West Hotel, Minneapolis, Minn., Sept. 10-12.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* will hold its next meeting at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in September.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street New York

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* hold regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8 p. m The Association headquarters are at Nos. 63 and 64 Baxter Court. Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* hold regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of erch month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at iss rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers' of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

American Association of Railroad Clerks.

The second national convention of this Association will be held at St. Louis, Mo., beginning Sept. 16. W. S. Wilcombe, 180 Summer street, Boston, Mass., is the Grand Secretary.

Roadmasters' Association of America.

The ninth annual convention of the Association will convene at the West Hotel, Minneapolis, Minn., Tuesday, Sept. 8, at 10 a. m., for a three-days session, instead of Sept. 10 to 12, as decided at the Detroit Convention, and previously announced.

In addition to the subjects already announced to be discussed at the convention this year, papers will be read on the following topics: Preservation of Ties, H. W. Reed; the development and design of steel rails, I. Burnett; Track Work, D. H. Lovell, and Standard Frogs, Wm. F. Ellis.

Securities Listed on New York Stock Exchange.

The New York Stock Exchange Governing Committee has listed the following securities:

Norfolk & Western's additional issue of preferred stock $200,000, making the total amount listed $36,000,000. These additional shares are the remainder of the 30,000 shares created in October, 1889, and deposited with the trustee of the 100-year mortgage.

Illinois Central's additional issue of capital stock $380,000, making the total listed $41,495,400. These additional shares are part of the 50,000 shares authorized to be issued in October, 1890.

Louisville & Nashville's additional issue of stock $4,800,000, making the total listed $52,800,000. This is part of the $7,000,000 of new stock authorized July 6. 1891.

The Civil Engineers' Club of Cleveland.

The regular monthly meeting of the club was held in its rooms, in Case Building, at 8 o'clock, July 14, President Gobeille in the chair, and 32 members and several visitors present. The report of the club's delegate to the General Committee of Engineering Societies, Columbian Exposition, as printed and distributed, was taken up, and, after some discussion, a resolution was adopted expressing approval of the work of the General Committee of Engineering Societies of the Columbian Exposition, so far as it has progressed. Mr. James Ritchie read a paper describing a design for a plate girder to span a 60-ft. store front and carry the floors above, of a heavily loaded building. The depth of the girder is the height of the second story and has openings in the web so that ordinary windows are not interfered with. The main difficulty is the transmission of shear on account of the web being interrupted by window openings. This is overcome by forming the bottom flange partly of a 32-in. plate securely riveted at the pilasters, so that the load concentrated there is transmitted through the rivets and the 42-in. plate, as if the latter were the full depth of the web.

The Secretary read a paper by Mr. E. H. Jones on the recent Providence meeting of the American Society of Mechanical Engineers.

PERSONAL.

—Mr. R. A. Parke, of the Westinghouse Air Brake Co., was married at Minneapolis, July 23, to the daughter of Mr. L. D. Day.

—Col. John M. Butler, President of the Brooklyn, Bath & West End, resigned last week. His successor has not yet been appointed.

—Mr. D. B. Robinson, General Manager of the Western Division of the Atlantic & Pacific for the last three years, has resigned to accept a position with the San Antonia & Aransas Pass road.

—Mr. Charles Fenn, Treasurer of the Missouri Car & Foundry Co. for the last year, and previously Treasurer of the United States Rolling Stock Co., has accepted a similar position with the new Madison Car Works, of which Mr. T. C. Salveter is General Manager.

—Capt. W. Henry Wells, who has been Chief Engineer of the Georgia Southern & Florida during its construction, and also of the Macon & Atlantic and the Macon & Birmingham, has resigned his connection with the system. He has been succeeded by Mr. B. C. Milner, who has been Assistant Chief Engineer for some time.

—Mr. W. W. Starr, who has been Superintendent of Transportation of the Central of Georgia for the last year, has been appointed Superintendent of the Main Stem Division under the recent reorganization of the operating department. Mr. Starr has been connected with the system since 1870, and since 1886 as Superintendent, first of the South Carolina line, and later of the Southwestern Division. Mr. Daniel D. Curran, who becomes Superintendent of the Southwestern Division, has been Superintendent of the Savannah & Western Division since February, 1890, and was previously Superintendent of the South Carolina Division. Mr. H. R. Dill, Superintendenl of the Main Stem Division, Mr. J. C. McKenzie, Superintendent of the Southwestern Division, and Mr. T. St. Moise, Superintendent of the Savannah & Atlantic Division, have resigned, their divisions being included in others.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—E. Borden has been appointed Superintendent of Transportation of the Wilmington, Charleston and Columbia divisions, with office at Wilmington, N. C.

Bellaire, Zanesville & Cincinnati.—M. R. Seal has been appointed General Agent, instead of Assistant General Manager, as reported last week, with office at Bellaire, O.

Boynton & National Park.—The following officers have been elected: President, H. Bond; Vice-President, Cutler Smith, and Secretary, C. Marshbanks. The headquarters are at Chattanooga, Tenn.

Bradford & Western.—The incorporators of this Pennsylvania company are: C. S. Whitney, Belmont, N. Y., president; H. S. McMullen, Frank L. Richardson, H. P. Whitney and G. L. Roberts, Bradford, Pa., and E. Breese, Lewis Run, Pa.

Carrabelle, Tallahassee & Gulf.—The company has reorganized by the election of the following officers: President, Milton Saylor, New York; Vice-President, E. T. Myers, Tallahassee, Fla.; Secretary and Treasurer, Robert Cumming; Assistant Secretary, W. A. Pollard; General Manager, A. Orr Symington; Directors, William Clark, William K. Klare, Robert Cumming and Milton Saylor, New York, and F. T. Myers, Tallahassee.

Central of Georgia.—General Superintendent V. E. McBee issued an order last week rearranging the divisions. The line is to be operated in three divisions, the Main Stem, the Southwestern and the South Carolina, instead of five divisions as at present. The Main Stem Division is to extend from Tybee and Savannah to Macon and Atlanta and from Griffin to Chattanooga, including the branches to Lyon, Eatonton and Thomaston. W. W. Starr is Superintendent, with office at Savannah. The Southwestern Division includes the lines from Macon to Columbus and Montgomery, the branch to Greenville, and all the lines south. D. D. Curran is Superintendent, with office at Macon, Ga. The South Carolina Division is not changed. B. C. Epperson is Superintendent, with office at Augusta, Ga. The Columbus & Western will be operated as part of the Georgia Pacific, W. B. Ryder Superintendent, with office at Birmingham, Ala.

Joseph C. Haskell, formerly Purchasing Agent, has been appointed Freight Agent at Atlanta, to succeed R. Schmidt, resigned.

Charlotte, Columbia & Augusta.—A. B. Andrews, Vice President of the Richmond & Danville, has been elected President of this road and the Columbia & Greenville, proprietary lines, succeeding V. E. McBee, resigned.

General Superintendents' Association of Chicago.—At the recent annual meeting officers were elected as follows: President, S. Sanborn, Chicago & Northwestern; Vice-President, A. W. Sullivan, Illinois Central; Secretary, J. D. Besler, Chicago, Burlington & Quincy.

Glade Creek & Raleigh.—The incorporators are James R. Beaty and Lewis M. Robertson, Horace W. Beatty and Paul G. Camp, of Raleigh County, W. Va., and Benton B. Wright, of Carolina County, Va.

Kansas City, Springdale & Clarksville.—The following are the directors of this company organized in Arkansas last week: John Smart, C. W. Schneider, H. L. Cross, Ray Nye and L. H. McGill.

Lake Shore & Michigan Southern.—R. F. Rumberger has been appointed Division Master Car Builder of this company on the Toledo Division, with headquarters at Norwalk, O. Thos. Fildes has been appointed Division Master Car Builder of the Western Division, with headquarters at Englewood, Ill. F. O. Bray, Division Master Car Builder at Adrian, Mich., will have jurisdiction on the Michigan Division.

Long Island.—Frank E. Haff has been appointed general car agent, with office at Long Island City.

Los Angeles Terminal.—W. H. Workman has been elected President of this company in place of B. F. Hobart, of St. Louis, resigned.

Michigan & Mackinaw.—The following are the incorporators of this Michigan road referred to last week: Frank B. Drake, Frederick S. Anable, Otis A. Wilson, Theodore C. M. Schindler, Louis I. Martin, William D. Stearns and Walter Nichols, all of Toledo, O.

Minneapolis, St. Paul & Sault Ste. Marie.—At the annual meeting in Minneapolis, July 21, the following Directors were elected: F. N. Finney, Thomas Lowry, R. B. Langdon, John Martin, John S. Pillsbury, W. D. Washburn and W. C. Van Horne. The directors accepted the resignation of Mr. Finney as President, and elected Mr. Lowry to the office. The other officers elected were the following: Vice-President, R. B. Langdon; Secretary and Treasurer, W. L. Martin; General Manager, F. D. Underwood.

New York, Lake Erie & Western.—T. A. Lawes has been appointed Master Mechanic of the eastern division, with headquarters at Jersey City.

Northwestern North Carolina.—The stockholders held their annual meeting at Winston, N. C., July 24, and elected the following directors: John H. Inman, Calvin S. Brice, New York; T. B. Keogh, Greensboro, N. C.; A. Chatham, Elkin; H. W. and J. W. Fries, Salem; John W. Brown, R. B. Glenn, J. Wilson, J. C. Burton, G. W. Hinshaw, Union; Col. A. B. Andrews, Raleigh, N. C. The directors elected Col. Andrews President; R. Brooke, Richmond, Secretary and Treasurer; H. W. Miller, Raleigh, Assistant Secretary.

Ohio Valley.—The Newport News & Mississippi Valley Co. having assumed the control of this road the authority of the general officers has been extended over the line. M. B. Cutter has been appointed General Superintendent and W. H. Prouty General Passenger Agent.

Paris, Choctaw & Little Rock.—The following officers were elected at the annual meeting at Paris, Tex., July 21: R. F. Scott, President; T. D. Craig, Vice-President; C. G. Woodbridge, Chief Engineer and General Manager; B. I. Baldwin, Jr., Secretary, and L. P. Harrison, Treasurer. The principal office is at Paris, Tex.

Pickens, Arvon & Western.—The charter of this company was filed in West Virginia some time ago. The incorporators are: David S. Thomas, Edwardsville, Pa.; John R. Powell and W. C. Jones, Plymouth, Pa.; John D. Williams, Glen Lyon, Pa.; Cynfelyn Hughes, W. F. Davies, Morgan J. Rees and John Evans, Nanticoke, Pa.; John D. Evans, Catasauqua, Pa.; Samuel Davis, Shenandoah, Pa.; Llewelyn N. Roberts, Scranton, Pa., and W. R. Thomas, Florence, W. Va.

Rutland.—The annual meeting of the stockholders was held at Rutland, Vt., July 23. The old Board of Directors was re-elected with the exception of James Roosevelt, who is succeeded by H. le Grand Cannon. These officers were re-elected: Percival W. Clement, President; Horace G. Young, Vice-President; Edward T. Smith, Treasurer; William Wells, Clerk.

Silverton.—At the annual meeting in Silverton, Col., July 22, the stockholders elected the following officers: Otto Mears, President; John A. Porter, Vice-President; Adair Wilson, General Counsel; John L. McNeil, Treasurer; Moses Liverman, Secretary, and the following Directors; Otto Mears, Adair Wilson, George Crawford, J. A. Porter, John L. McNeil, J. H. Earnest Waters and Moses Liverman.

Toledo, Ann Arbor & North Michigan.—F. S. Chandler, Purchasing Agent and Assistant Secretary, has been appointed Secretary, with office at Toledo, O., to succeed B. F. Jervis, resigned. Mr. Chandler will continue to act as Purchasing Agent.

Toledo & Chicago Bee Line.—Erle Manchester, of Toledo, O., has been appointed Assistant Engineer, with headquarters at Angola, Ind.

Toledo, St. Louis & Kansas City.—T. S. Timpson, recently Eastern Passenger Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has accepted a similar position with this company. His headquarters will be in Buffalo, N. Y.

West Shore Fast Freight Line.—James McQueen, Jr., has been appointed General Manager, with headquarters at Detroit, Mich. He succeeds David Brown, the Assistant General Freight Agent of the Chicago & Grand Trunk.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Alloway & Quinton.—The right of way is now being obtained for this line, which was recently incorporated in New Jersey, to build a short branch of the Pennsylvania. The surveys have been made and the construction work will probably begin as soon as the right of way is obtained. The route is located from a point on the Salem branch of the West Jersey road at Alloway station to Quinton, N. J., a distance of 4¼ miles.

Au Sable & Northwestern.—A charter was filed in Michigan last week under this title for a road to extend from Au Sable to Charleston, Otsego County, and Albert, in Montmorency County. The company is probably a reorganization of the line between Au Sable and Potts, Mich., 37 miles, which was owned by the J. E. Potts Salt & Lumber Co., recently declared bankrupt.

Bradford & Western.—The company has been incorporated in Pennsylvania to construct a road from a point on the line of the Buffalo, Bradford & Pittsburgh and the Buffalo, Rochester & Pittsburgh at Lewis Run, in Lafayette, McKean County, Pa., to a point on the Bradford road near Marchburg. The length of this route is seven miles. The capital stock is $70,000. C. S. Whitney, Belmont, N. Y., is President.

Boynton & National Park.—The company expects to secure in a few weeks the balance of the right of way for the road along the Tennessee River. The project is to build a road from Harrison, on the Tennessee River, south, passing to the east of Chattanooga to Graysville, Ga., and thence west toward Chattanooga to Boynton, near which connection will be made with the Chickamauga and National Park Belt Line. The projects involve a mileage of about 35 miles, but about 25 miles of this distance has been graded under other charters. It is proposed to issue bonds on the road already graded to provide funds for completing the line and preparing it for operation. H. Bond, of Chattanooga, is President.

Carolina Midland.—The extension from Barnwell southeast to Allendale, S. C., a distance of 17 miles, is now completed to the connection with the Port Royal & Augusta line of the Central Georgia. The rails have been purchased, and tracklaying will be commenced as soon as they are delivered.

Chesapeake & Ohio.—The tracklaying on the Craig Mineral branch to Craig City was completed July 10. This branch connects with the James River Division at Eagle Rock, Va., and extends southwest along the Craig River Valley a distance of 26 miles, to near Newcastle, the county seat of Craig County. The tracklaying was begun in April and was finished by July 1 with the exception of the last four miles.

On the Hot Springs Branch the track has now been laid for about 10 miles north of Covington, Va., west of Clifton Forge, where the branch leaves the main line. It is expected to complete the road to the Warm Springs, about 25 miles from Covington, by Aug. 25. The tracklaying on this line was begun in May, but five miles of the 10 now completed has been laid since July 1.

Chicago & West Michigan.—The grading on the Chicago & North Michigan, the Charlevoix extension of this road, is progressing rapidly. J. H. McLean & Co., of Traverse City, Mich., the contractors, will commence laying the track from Traverse City, the southern terminus of the extension, about Aug. 1. H. F. Northrup is Division Engineer in charge of the work.

Columbia River & Astoria.—The company was incorporated in Oregon last week to build the proposed road between Astoria and the Northern Pacific, for which subscriptions and right of way have been voted at Astoria. The line is to extend westerly to a point on the Northern Pacific, where it crosses the Columbia River at Goble Point, near Kalama. The capital stock is $1,500,000.

Corpus Christi & South America.—It is reported that the grading on this line south of Corpus Christi, Tex., has been suspended indefinitely. Since the construction work was begun last November by Griffin Bros., of Minneapolis, 49 miles has been graded, about half of the work being completed this year. Engines and cars for construction work have also been purchased and delivered. The work is not likely to be resumed until the Pan-American Construction Co., the company which has the contract to build the line, has been reorganized.

Delaware, Lackawanna & Western.—The company is building a spur one and a half miles long from Kendall, a point near Drakesville, N. J., to Lake Hopatcong.

Duluth, South Shore & Atlantic.—Surveys have made for a line about eight miles long from Kitchi, Houghton County, Michigan, to reach a large tract of timber.

Dutchess County.—The contractors J. C. Stanton & Co., of New York, will resume work in a few days on the construction of this road from Poughkeepsie southeast to Hopewell Junction, on the New York & New England, 12 miles. The money has been subscribed to complete this line, principally by the syndicate controlling the Poughkeepsie Bridge Co. The road has just been taken out of the receiver's hands. It is expected to have it in operation early in November.

Exeter & Amesbury.—A new survey was begun last week at Epping, N. H., by Engineer Dudley, of Brentwood. The road is to extend from a connection with the Concord & Montreal at Epping southeast through Brentwood and Exeter to Amesbury, Mass., on the eastern division of the Boston & Maine. The line in New Hampshire is about 17 miles long and in Massachusetts about two miles long. The charter was passed at the last sessions of the state legislatures, the company in New Hampshire being known as the Exeter. The project is the revival of an old one for which surveys were made 20 years ago. The prospects for building the line now depend largely on the proposed contract with the Concord & Montreal. John J. Bell, of Exeter, N. H., is President of the company.

Georgia Roads.—Bills have been introduced in the legislature to incorporate the Georgia Mineral, the Atlanta, Hapeville & Manchester; the McRea, Ocilla & Southwestern, the Alcove & Northern; the South Atlantic to build through Rome and Atlanta to Augusta; the Talbotton & Western, the Thomson & Lincoln, the Washington & Middleton and the Dalton & Spring Place.

Glade Creek & Raleigh.—A charter was granted in West Virginia last week to this company to build a road from Glade Station, on the Chesapeake & Ohio, in Fayette County, up Glade Creek, down Little and Big Beaver creeks, to the mouth of Big Beaver Creek, at Piney River, three miles from Raleigh C. H. The principal office is to be at Crow, Raleigh County. The capital stock is $75,000. James R. Beatty, of Raleigh County, and others are incorporators.

Great Northern.—In London last week £1,000,000 of the Pacific extension four per cent. bonds of the St. Paul, Minneapolis & Manitoba, guaranteed by the Great Northern, were offered to the public at 81 by Glynn, Mills & Co., and all of the bonds were taken. This gives the company the money it needed to carry on its extension, over 200 miles of which is already completed.

Great Northwest Central.—A. J. Charlebois, of Montreal, the contractor for this road, is understood to have completed arrangements in London for completing the balance of the line to Battleford, about 100 miles northwest of the present terminus at Oak River. The track is now laid on 50 miles of the road, from the Canadian Pacific at Brandon, Man., to Oak River, but the transfer of the line to the company for operation has been delayed on account of disagreements with the contractors.

Kentucky Midland.—The contract has been recently let to Capt. Anderson, of Chicago, for building an extension of the line east of Paris, Ky., to Salt Lick Station, on the Chesapeake & Ohio Southwestern, a distance of about 45 miles. The right of way is now being secured.

Loveland Pass Mining & Railway Tunnel Co.—The company has been recently organized to construct a direct line from Loveland southwest to Dillon, Colo. The line is projected by the Union Pacific, to connect the Colorado Central with Leadville by way of Dillon. It is proposed to tunnel the main divide near Loveland Pass. The company has elected the following board of directors: F. L. Ames, Boston; Sidney Dillon, New York; R. J. Duncan, P. Touhey and Willard Teller, Denver, Colo.

Maine Shore Line.—The locating survey has just been commenced at Columbia, about 30 miles east of Hancock, Me. The survey is being made by H. Hilliard, of Oldtown, Me., and is for the western division. Another survey will begin in a few days at Calais for the eastern division. Col. J. N. Greene, of Bangor, Me., the Chief Engineer, will have general charge of the work. The road east of Hancock will pass through Sullivan and through the southern part of Washington County along the shore line through Gouldsborough, Steuben, Millsbridge, Harrington, Columbia, Whitneyville, Machias, Dennysville and Perry, to Eastport, with a branch south via Robbinston and Red Bank, to Calais, Me., a total distance of about 112 miles. The maximum curve will be eight degrees and the maximum grade 1½ per cent.

Michigan & Mackinaw.—The incorporation of this company in Michigan was noted last week. The charter is for a line from the state line in Hillsdale County, northwest of Toledo, extending in a northwest direction to Allegan, Mich. The incorporation is probably for the reorganized Cincinnati, Jackson & Mackinaw, which is to be sold Oct. 6. Several of the incorporators of the new line are directors of the latter company.

Middlesborough Belt.—The track has been laid on the extension of the Bennett's Fork branch along West Cabin Creek and on the short branch on Stony Fork Creek near Middlesborough, Ky. The two lines are six or seven miles long.

Minneapolis, St. Paul & Sault Ste. Marie.—President T. R. Lowry, in a recent interview, states that the track is now laid to within 75 miles of Bismarck on the old grade between Aberdeen and Bismarck, a distance of 165 miles. The work is now in progress, and "it is proposed to lay the track as fast as we can afford to do it."

Nashville & Harriman.—The company has been chartered by L. D. Lilly, E. M. Gallion and W. H. Julian, of Harriman, Tenn., and W. T. Smith, of Nashville, to build a road from Harriman in a westerly direction toward Nashville, and in an easterly and southeasterly direction from Harriman to a connection with the East Tennessee, Virginia & Georgia Railroad.

New Roads.—L. J. Kapke, of Beaumont, Tex., has recently begun a survey from Jasper north to Marshall, a distance of about 100 miles, the northern division of the proposed road from Sabine Pass north between the Sabine and Neches rivers, recently described in these columns. The route from Sabine Pass and Beamont north to Jasper, about 70 miles, is very level and will not be surveyed at present.

Northeastern Nebraska Improvement Co.—A survey was recently made by engineers of this company for a road from South Sioux City through Dakota County to Homer, Neb. The route was nearly an air line, but it has been found that the right of way which would be needed through South Sioux City and its suburbs will be very expensive and a new survey will soon be made for the line. It will probably run southwestward about 3½ miles and thence south 10 miles to Homer. The route will be through the level bottom lands of the Missouri River and the first three miles through timber.

Omaha, Kansas Central & Galveston.—A contract has been let to Robinson & Brickley, of Easton, Mo., for building the line south of the Red River, from the Texas state line north of Denison. The contract recently let to T. A. Butler, of Lyons, Kan., is for the line from Superior, Neb., south to the Red River. Edward Roemer, 79 Cedar street, New York City, is Chief Engineer.

Paducah, Cairo & Southwestern.—Articles of incorporation were filed in Illinois last week by this company and also by the Paducah & Fort Jefferson, both of which propose to construct a road between Cairo, Ill., and Paducah, Ky.

Paris, Choctow & Little Rock.—At the recent annual meeting at Paris, Tex., it was decided, an officer writes, to build this fall the first 30 miles of the road from Paris north to the Red River at the head of navigation. The bridge across the Red River will be an iron drawbridge about 800 ft. long. The line to the Red River is through fertile cotton fields. The line has been surveyed through to Little Rock via Hot Springs, the distance being 203 miles. North of the river coal and other minerals have been found for 40 miles. The balance of the distance to Little Rock, 133 miles, is through farming land and pine, oak and hickory timber. C. G. Woodbridge, of Paris, Tex., is General Manager.

Pennsylvania.—The tracklaying on the single track of the Trenton Branch west of Norristown was completed July 23, the connection with the main line being made at Glenloch, near Frazer, Pa. The line east of Norristown to Morrisville, 31 miles, is now in operation, but the ballasting and other work west of the Schuylkill River will delay the opening of the entire 52 miles of the line for a month or so.

It is stated that the McKeesport & Bessemer, recently completed through McKeesport, Pa., to a point near the plant of the W. Dewees Wood Co., is to be extended up the Youghiogheny River to a point near Long Run and dividing into two branches, one to connect with the Sewickley Branch, and the other to extend to Jeannette, forming a loop from the main line at Brinton.

Port Angeles Southern.—P. H. Smith & Co., of Seattle, have, it is reported, received the contract for building the line, which is to extend from Port Angeles, Wash., to a connection with the Port Townsend Southern at Junction City, west of Port Townsend, a distance of 25 miles. Subsidies of about $360,000 in stock and right of way have been voted by the towns. F. S. de Wolfe, of Seattle, is President of the company, and C. E. Mallette, of Port Angeles, is Vice-President.

Portland & Rumford Falls.—As soon as the survey now in progress under Parker Spofford, of Bucksport, Me., for the northern extension from Gilbertsville west to Rumford Falls, Me., 15 miles, is completed, the officers will let the contract for building the line.

Rio Grande Western.—The contractors are reported to have 700 men grading on the Tintic extension, on the heavy work in the cañon east of Homansville, Utah. A large number of men are employed on the mountains east of Eureka, and work on the three tunnels which are to be built in that vicinity will soon begin. Besides the tunnels there will be a trestle just west of Homansville Pass, which will be 600 ft. long and 120 ft. high. The curvature between Homansville and Eureka will be very heavy. This work is on the southern division of the line. On the northern end the grading is progressing between Payson and Goshen. The road is to be about 45 miles long and connects with the main line near Springville, between Spanish Fork and Provo, running south of Great Salt Lake, and thence southwest to the Tintic mines. The line will probably be completed to Eureka by Jan. 1, unless the tunnel work is delayed.

Sodaville.—The company has been incorporated in Oregon to build a line from Albany southeast through Linn County to Sodaville, Or., a distance of 20 miles. The capital stock is $60,000. The incorporators are J. L.

Hill, W. W. Parrish, Frank Davis. H. W. Perry, H. A, McCarhiey, H. M. Perry, Reuben Davis, all of Albany, Or.

South Bound.—The first passenger train on the line north of Savannah to the Savannah River, a distance of 31 miles, was run last week. The track is laid north of the Savannah River for over 30 miles to a point beyond Deer's Mill Pond, S. C., and it is expected that the line will be opened by Sept. 1, to Graham's, on the South Carolina road. By this time the bridge across the Savannah River will probably be completed. The trestlework on the north side of the river is causing the most serious delay. The grading has been practically finished on the entire road to Columbia, S. C., with the exception of 10 miles. Arrangements have been made with the Richmond & Danville for temporary terminal facilities at Columbia and with the Central of Georgia at Savannah.

Southern Pacific.—The grading and tracklaying on the new line at the Pecos River, between Comstock and Shumla, Tex., will not be completed until September. The work has been delayed by the rockwork. There have been several cuts, 22 ft. deep and less, through lime rock. The new bridge over the Pecos River will be of the cantilever type, 316 ft. above the water. There will be 44 pier groups, 4 together, and the channel span will be 800 ft. Thomas Jackson, one of the contractors for the grading, gives report of progress, which may be summarized as follows: The masonry work upon which the east end of the bridge is to be supported is all complete, and that for the west end will be completed in two months. Then the iron work will be ready to begin, and as the bridge is to be of iron throughout it is as if it were beginning to be built. It will all probably be finished by the first of the year. There are now 100 cars of iron on the ground to be used in the construction. This new line is being built as a cut-off, the present line crossing the Pecos River about seven miles further down the river, the present line being unsuitable for large traffic, for it has a large amount of 10 degree curvature, heavy grades and several deep cuts, a number being 52 ft. deep. There are also two tunnels. The new line has a maximum grade of 52 ft. per mile and maximum curvature of four degrees.

South Florida.—The contract for grading the extension north of Pemberton, Fla., will probably be awarded next week. This line is to extend from Pemberton north to near High Springs, a distance of about 90 miles. The surveys were made this spring and the line located to High Springs, northwest af Gainesville, Fla.

South Galveston & Gulf Port.—The articles of incorporation of the company were filed in Texas last week. The road will be about 20 miles long, extending from a point in the city of Galveston, Tex., through the city and south on Galveston Island.

Toledo, Walhonding Valley & Ohio.—The Chief Engineer, J. A. Hanlon, of Coshocton, O., will receive bids until Aug. 5 for the grading and trestlework between Coshocton and Loudonville, a distance of about 46 miles. Loudonville is about 15 miles south of Mansfield, the terminus of the old Northwestern Ohio, which is now consolidated with this line. The track of the Pittsburgh, Fort Wayne & Chicago will be used to Loudonville, and the new road will be built from that point southeast to a connection with the Pittsburgh, Cincinnati & St. Louis at Coshocton. The line south of Coshocton to the Ohio River will not be built this year. The line for which the contrats are to be let is to reach the coal fields at Cambridge.

Western Counties.—A dispatch from Halifax, N. S., states that the line built by the Canadian Government between Digby and Annapolis was opened for traffic July 27. The line is about 20 miles long, connecting the Western Counties and the Windsor & Annapolis and completing the route along the north shore of Nova Scotia from Yarmouth to Halifax.

West Virginia Central.—At the annual meeting at Cumberland, Md., July 28, the stockholders voted to ratify the contract made with the Baltimore & Ohio to complete a connection between the two lines by building an extension to Bealington, W. Va. It was reported that of the $300,000 of the company's bonds authorized to be issued at $105 the company had sold $135,000. The directors were authorized to issue $200,000 of new bonds at $105.

Winnipeg & Hudson's Bay.—It is announced that the contract for the construction of the road has been awarded to Ross, Mann & Holt, of Montreal, for $11,000 per mile, exclusive of rolling stock. The bill granting a Dominion subsidy has passed the House of Commons, but is pending in the Senate. If it becomes a law the contractors may do a little grading, but otherwise it is unlikely that any work will be done.

GENERAL RAILROAD NEWS.

Brooklyn & Rockaway Beach.—Bonds to the amount of $350,000 will shortly be issued by this company for the purpose of double tracking the road and developing suburban settlements.

Chicago, Burlington & Quincy.—The following report shows the earnings of the road for June and the half year:

	1891.	1890.	Inc. or dec.
Gross earnings	$2,609,199	$2,740,583	D. $131,384
Oper. expen	1,650,121	1,997,694	D. 337,572
Net earnings	$919,077	$742,889	I. $206,188
Fixed charges	792,000	773,515	I. 18,484
Surplus	$157,077	Def. $30,626	I. $187,703
Six months ending June 30.			
Gross earnings	$14,769,586	$16,937,024	D. $2,167,437
Oper. expen	9,751,972	11,345,440	D. 1,593,468
Net earnings	$5,017,614	$5,591,584	D. $573,969
Fixed charges	4,752,000	4,461,093	I. 110,906
Surplus	$265,614	$950,487	D. $684,875

This shows for the half-year:

	1891.		1890.
Surplus for dividends	$266.61		$950,492
2 per cent. paid	1,527,890	(2½ p. c.)	1,909,814
Deficit	$1,262,275		$959,322

Chicago & Kansas City.—This company has been organized to succeed the Chicago, Kansas City & Texas, controlled by the Winner Investment Co., of Kansas City. The new company has a capital stock of $1,500,000. The Kansas City Bridge & Terminal Co. and other companies controlled by the Winner Investment Co. will be consolidated with the railroad when the reorganization of the Investment Co. is completed.

Cincinnati, Hamilton & Dayton.—The long-pending suit of the stockholders against W. R. McKeen, President of the Vandalia, for over $1,000,000, was decided in favor of the defendant at Indianapolis, July 23. The suit grew out of the Ives-Stayner deal.

Lehigh Valley.—The company is understood to have renewed this week its contract with the Philadelphia & Reading, by which it will continue the use of the latter's tracks from Bethlehem to Philadelphia. There has been some dissatisfaction about the lease under which the road was operating, and for some time past there has been talk of an independent line from Bethlehem, for which surveys have been made. All work on the prospective road will now probably be suspended.

New Orleans & Southern.—This company has been organized by the bondholders of the New Orleans & Gulf, recently sold in foreclosure proceedings. The property was bought by E. B. Kruttschnitt, Thomas P. Fowler and Richard Irvin, the committee who represent the English bondholders, for the sum of $125,000.

New York, Lake Erie & Western.—The following is the report of the earnings of the road for June and the nine months of the fiscal year:

Month of June—	1891.	1890.	Inc. or Dec.
Gross earnings	$2,584,494	$2,426,789	I. $157,704
Operating expenses	1,643,556	1,621,991	I. 21,565
	$940,938	$804,798	I. $136,139
Less proportions due leased lines	206,986	175,475	I. 31,511
Net earnings	$733,952	$629,323	I. $104,628
Nine Months, Oct. 1 to June 30—	1891.	1890.	Inc. or Dec.
Gross earnings	$21,390,722	$21,196,411	I. $194,311
Operating expenses	14,196,917	13,981,315	I. 215,602
	$7,193,805	$7,215,096	D. $21,291
Less proportions due leased lines	1,862,988	1,880,151	D. 17,164
Net earnings	$5,330,817	$5,324,945	D. $4,127

Pacific Short Line.—It is announced that the road will be sold at Receiver's sale in Omaha, Sept. 12. The decree of sale was issued some time ago.

Pennsylvania.—The earnings of the lines east of Pittsburgh and Erie for June and the six months are given in the following table:

Month of June.	1891.	1890.	Inc. or dec.
Gross earnings	$5,440,653	$5,172,002	I. $268,651
Oper. expenses	4,083,079	4,114,899	D. 31,820
Net earnings	$1,357,574	$1,057,103	I. $300,471
Jan. 1 to June 30.			
Gross earnings	$31,476,005	$31,959,105	D. $483,100
Oper. expenses	22,467,926	22,982,861	D. 514,935
Net earnings	$9,008,079	$8,976,244	I. $31,835

The western lines show a gross increase $66,417 for June, as stated last week, decreased expenses of $109,000, and a net increase of $175,417. For six months the western lines show a gross decrease of $1,192,527, a decrease in expenses of $1,402,488, and an increase in net earnings of $209,960.

Philadelphia & Reading.—The company issues the following statement of the business for the month of June, 1891, as compared with the same month last year:

Month of June.	1891.	1890.	Inc. or dec.
Gross receipts	$1,820,819	$1,86 ,087	I. $46,237
Gross expenses	951,317	954,569	I. 3,251
Profit in operating	869,531	912,518	I. 42.986
Other receipts	33,385	41,966	I. 8,580
Profit for month	902,917	954.484	I. 51,567
Expen. for perm't imp	31,103	35,765	D. 4,662
One-twelfth of year's fixed charges	620,283	593,504	I. 21.778
	651,386	634,270	D. 17,116
Surplus	251,530	320,214	D. 68,684
Year to June 30.			
Gross receipts	11,630,915	11,316,469	D. 314,446
Gross expenses	6,667,814	6,761,984	D. 84,170
Profit in operating	4,953,101	4,554,484	I. 398,616
Other receipts	238,899	247,171	D. 8,272
Profit for month	5,192,000	4 801,655	I. 390,344
Expen. for perm't imp	295,081	435,764	D. 40,682
One-twelfth of current year's fixed charges	4,316.121	4,189,532	I. 126,589
	4,611,203	4,625.296	D. 14,093
Surplus	580,797	176,359	I. 404,437

The gross receipts of the Coal & Iron Co. for June, 1891, were $1,663,420, an increase of $61,014. The deficit was $53,867, an increase of $18,156. For the year the gross receipts were $10,043,196, an increase of $875,598. The deficit was $784,867, a decrease of $10,358.

Providence & Stonington Steamship Co.—The stockholders of this company at a special meeting in Providence last week voted to increase the capital stock by $500,000 to $2,000,000, and authorized the directors to dispose of all stock not taken at $150 per share by the stockholders. The stockholders also voted to build two new steel boats.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, July 29, 1891.

As was anticipated, passenger rates between St. Louis and Kansas City and Chicago are likely to be demoralized for a greater part of the month of August on account of the G. A. R. Encampment at Detroit. The Wabash made a rate of $8 from St. Louis to Detroit and return by its direct line, the returning coupon good via Chicago. The Alton met this, and in addition announced round-trip rates of $5 between St. Louis and Chicago, $8 between Kansas City and Chicago, and $14.50 Kansas City to Detroit and return. The $8 rate has now been made general through Illinois. The rates originally adopted by the Western Passenger Association were one fare for the round trip, which is $17.75 from Kansas City and $14.25 from St. Louis to Detroit and return. The cut between St. Louis and Chicago amounts to $5 each way, and on the Kansas City rate it is $6. It is hard to see what excuse any of the lines can have for any further cutting or any extension of the reduced rates beyond the present territory involved.

Freight rates are being generally well maintained, and very little complaint in this direction is heard.

In addition to the reductions in Western passenger territory, the Ohio & Mississippi has made a round-trip rate of $10.50 between St. Louis and Cincinnati, and the Alton has joined the O. & M. in making a rate of $17 round trip between Kansas City and Cincinnati.

The Commissioners of the Western Traffic Association are in session this week, hearing appeals and considering other matters referred to them by the Advisory Board. The most important subject before them is the consideration of rates on iron ore from the Michigan mines.

The Southwestern Railway & Steamship Association is in session here, having adjourned from St. Louis.

The roads have finally agreed to run two harvest excursions, one in August and one in September, for a fare and one-third.

The Alton has put on a Sunday train each way between Chicago and St. Louis.

Lake and rail rates have been advanced to a basis of 48 cents first class, Chicago to New York. Lake grain rates are remarkably firm and advancing. A large portion of the lake tonnage is engaged in the ore-carrying trade, and vessel owners predict a shortage of tonnage to move the August grain. Vessel men predict a four-cent rate on wheat to Buffalo in the near future. One shipper offered three cents yesterday, but found no takers. Announcement is made of an advance of one-half cent per bushel on wheat and corn from Buffalo to New York by the rail lines Aug. 1. There is likely to be all the tonnage both the lake and the rail lines can carry, and there is no reason why rates should not be well maintained for the balance of the season.

The Anchor line, in connection with the West Shore, has decided to meet the 42-cent rate on wool to Boston and New York from Chicago and Milwaukee.

The Wabash has withdrawn the coal tariff by which it made a rate from Toledo to the Missouri River 70 cents per ton less than the rate by way of Chicago. The Wabash people explained that the tariff was issued as long ago as last September, and that when new ones were agreed upon in January they forgot to withdraw the old one.

The New York, Chicago & St. Louis has yielded to the pressure brought to bear upon it, and now informs the Atchison, Topeka & Santa Fe that it cannot join that road in making an excursion rate of $7.50 from Peoria to Niagara Falls and return by way of Chicago.

Traffic Notes.

The roads in the Trans-Missouri Association are taking action toward limiting all tickets sold.

The World's Fair Commissioners of the State of Washington say that the Northern Pacific has promised to transport their exhibit to Chicago free. This will be equivalent to a gift of about $20,000 to the state.

The Peoria & Pekin Union road, whose business is practically all terminal and transfer freight and passenger work for other roads, has notified the companies operating over its tracks that from Aug. 1 a charge of 25 cents per car per day will be made against the companies on freight cars left standing on its tracks more than 10 days each. It is claimed that empty cars have been stored in Peoria by the various companies to an unreasonable extent. It appears that a charge of this kind has been partially enforced heretofore.

The Colorado Midland, in connection with the Atchison, has issued a combination tourist ticket which is expected to prove popular with the traveling public who go sight-seeing in the Colorado region. The ticket is good for passage on any regular train between Colorado Springs and Woodlawn Park, and the holder is entitled to as many stop-overs as he desires. The novel feature, however, is that it includes hotel accommodations at various hotels on the route, and is issued for one week, or longer up to one month, at a stated rate per day, thus enabling the passenger to regulate his trip to suit his convenience, at a well-defined expense.

The Railroad Commissioners of Texas have decided, on application of the Houston & Texas Central, that the new law of the state does not prohibit the issuing of free passes. Certain clauses in paragraphs C and E of the law seem to conflict with each other, but the Commissioners held that the final phrase, which allows free transportation to be given to any person not prohibited by law leaves the bars down, as there is no law actually prohibiting the issue of passes to any one. The Commissioners have also ruled that household goods, section-house supplies or other property belonging to railroad employés cannot be transported free, or at rates other than those prescribed in the regular tariff applicable to such property.

It seems that the New York State law which appears to limit the charge for a sleeping-car berth to 80 cents per night, which was referred to in these columns last week, has been before the railroad commissioners, a passenger on the Rome, Watertown & Ogdensburg having complained of extortion in August, 1889. The Commissioners held that, the law having been in existence since 1858 without protest on the part of the public, who have been paying $2 or more per night since the establishment of the present sleeping-car lines, the case of the claimant was rather weak; but the Attorney-General of the state, to whom the case was referred, held that a $2 rate was clearly illegal, and the board told the complainant that he could take his case to the courts if the Wagner company refused to refund the $1.20 overcharge.

East-Bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending July 23 amounted to 46,384 tons, against 45,553 tons during the preceding week, an increase of 831 tons. The proportions carried by each road were:

	Wk. to July 23.		Wk. to July 16.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	7,345	15.8	5,807	12.8
Wabash	2,951	6.4	3,335	7.3
Lake Shore & Michigan South.	7,480	16.1	5,919	13.0
Pitts., Ft. Wayne & Chicago	5,443	11.8	6,050	13.3
Pitts., Cin., Chicago & St. L	5,561	12.0	5,497	12.1
Baltimore & Ohio	2,600	5.6	3,384	7.4
Chicago & Grand Trunk	4,405	9.5	3,640	8.0
New York, Chic. & St. Louis	5,480	11.8	4,570	10.0
Chicago & Erie	5,119	11.0	7,351	16.1
Total	46,384	100.0	45,553	100.0

Of the above shipments, 1,768 tons were flour, 15,676 tons grain, 1,349 tons millstuff, 5,120 tons cured meats, 7,386 tons dressed beef, 2,217 tons butter, 1,475 tons hides, 441 tons wool and 7,148 tons lumber. The three Vanderbilt lines carried 43.7 per cent., while the two Pennsylvania lines carried 23.8 per cent.